The Engineering and Mining Journal

VOL. LXXXI. NEW YORK, JUNE 30, 1906. NO. 26.

Published Weekly at
505 PEARL STREET, NEW YORK
London Office: 20 Bucklersbury, London E. C., Eng.

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Canada, Mexico, Cuba, Porto Rico, Hawaii or the Philippines.

To Foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

Copies are on sale at the news-stands of the following hotels:—Waldorf-Astoria, New York; Brown Palace, Denver; Palace Hotel, San Francisco, and the leading hotels in the principal cities.

Copyright, 1906, by
THE ENGINEERING AND MINING JOURNAL.

Entered at New York Post Office as mail matter of the second class.

During 1905 THE ENGINEERING & MINING JOURNAL *printed and circulated* 454,250 *copies, an average of* 8735 *per issue. Of this issue* 8000 *copies are printed. None sent regularly free. No back numbers beyond current year.*

Notes on Some of the Less Common Metals in the West of England.

BY J. H. COLLINS.*

Tin—The west of England peninsula, comprising a great part of Cornwall and a small part of west Devon, was for many centuries the principal source of the tin used throughout the world, although many other localities were known as small producers. As is the case elsewhere, tin usually occurs in the west of England as stannic oxide (cassiterite); it has been calculated that this region has yielded in all not less than two millions of tons of "black tin."

Copper, Lead, etc—For a much shorter period, the same region supplied the greater part of the world with copper, about one million tons (contained in 12 million tons of dressed ore) having been extracted from the mines during the last four centuries. The most abundant ores have been the sulphides (chalcocite, chalcopyrite and fahlerz), and the oxides (cuprite and melaconite); but, beside native copper, a great variety of mineral species containing copper have been found. Many of the mines have yielded at times considerable quantities of lead, zinc, manganese and iron ores, the last being sometimes manganiferous or titaniferous. Gold and silver are widely distributed, but only occasionally in paying quantities, and then usually as by-products. Arsenic has frequently been, and indeed still is, a valuable by-product of the treatment of the tin and copper ores. The mines have also yielded ores of antimony and bismuth, nickel and cobalt, tungsten, uranium and molybdenum.

Antimony—This element has usually occurred with lead, and under like conditions; mostly as the simple sulphide (antimonite), but also in combination with lead (jamesonite), copper (bournonite), silver, etc.; it also occurs as oxide. It is always found in veins in stratified rocks of a fossiliferous series, and at a distance from the granite. Antimony in the west of England is far less abundant than lead; in fact, the only parts of the region where it has been found on a commercial scale are: The north coast of Cornwall, in the parishes of Endellion, St. Minver, St. Merryn and St. Teath; on the south coast, between Pillaton and St. Erney; and in central Cornwall, in St. Stephens and St. Austell (near Mevagissey). Antimony has also been found in small quantities at Henock, near Boveytracey, in Devon. Borlase says that antimony was worked in St. Stephens, St. Austell and St. Minver in 1758. In 1774-6, 95 tons of ore were sold from Wheal Boys in Endellion, and 25 tons from other Cornish localities (probably Tredinnick in St. Erney). The Pillaton mines sold 132 tons in 1819-21; Pengenna mine, near Wadebridge, sold 15 tons in 1861, and "a few hundredweights" in 1862. It is probable that several small parcels have been sold from mines in this neighborhood without having been officially reported.

Bismuth—Though a rare mineral in the west of England, this has long been known to occur there. It was found at Pengreep, in Gwennap, before 1775, when Dr. Albert Schloesser visited the mine and showed how it might be separated from the cobalt (with which it occurred) so as to utilize both metals. Hitherto it has been found only in veins yeilding tin or copper, together with silver, arsenic, nickel or cobalt, as at Botallack and Wheal Cock, St. Just, Herland, St. Ives Consols, Dolcoath, East Pool, Pednandrea, Wheal Sparnon, Trugo, etc. It has perhaps been most frequently found as native metal; but it has also occurred as sulphide, oxide or carbonate; as at Wheal Owles in St. Just, Wheal Coates in St. Agnes, Cost-all-lost in Roche, Trethurgy, St. Columb, etc.

The following sales of bismuth ore have been reported, in the official mineral statistics:

	Tons.	cwt.	qr.	lb.	Value.
1871. Dolcoath	..	2	2	0	£ 13 16 6
1872. East Pool	2	0	0	0	100 0 0
1873. East Pool	1	4	3	26	68 14 0
1874. East Pool	..	15	0	0	38 8 3
1876. East Pool	..	7	3	18	14 0 0
1877. East Pool	..	8	0	0	15 4 0
1879. Wheal Owles	..	1	1	0	14 0 0
	4	19	2	16	£263 11 9

The bismuth from Wheal Owles was mainly carbonate; from the other mines it was mostly native. As a rock constituent, bismuth is not known in the west of England, but it was found nearly a century ago in the metallic condition embedded in red jasper in two of the copper lodes at Botallack; native bismuth has also been found in the tin ground of a stream worked in St. Columb.

Nickel and Cobalt—These were usually found together, and associated with iron, arsenic and sulphur, either in tin or copper veins, or else in cross-courses near their intersections with such veins. The most important deposits were those found at St. Austell Consols about the middle of the last century; but small quantities have been sold from Fowey Consols, East Pool and other mines. The earliest notice of the occurrence of these metals in the west of England seems to be that of Dr. Borlase,[1] who says that nickel was found at Pengreep in Gwennap before 1754. It was discovered in a branch of a lode while driving in adit but did not hold in depth. Mr. Beauchamp received a prize (of £30) from the Society of Arts, for the best nickel ore raised in England. Pryce, writing 20 years later, said that cobalt had been found at Turgo, in St. Columb, in a vein from 4 to 6 in. wide where it crossed a copper lode; but the deposit continued only for a short distance. It was then worth about £60 per ton. Cobalt has also been found at Dudnance mine, in Illogan; in a mine near Ponsanooth, and in Dolcoath. In 1818 kupfernickel was raised at Pengelly mine in St. Ewe (according to Mr. Gregor), but nothing is said as to the quantity or quality.

Sir Henry de la Beche, writing in 1837, says that cobalt had been found in a cross-course adjoining a copper lode at Wheal Sparnon, near Redruth (one piece of the ore weighed no less than 1333 lb.) also at Wheal Unity, Polgooth, Herland and Botallack. At Wheal Unity 1,700 lb. (of "inferior quality") was sold in 1820. Cobalt had also been found at Wheal Huckworthy near Sampford Spiney, and in the Roscommon Cliffs at St. Just. The ores have mostly been tin-white cobalt (smaltite), and bright-white cobalt (cobaltite); but occasionally cobalt-bloom (erythite).

The following have been the most important sales:

	Ton.	cwt.	qr.	lb.	Value.
St. Austell Consols (1854 to 1861) (chiefly nick'l)	133	16	3	15	£7396 18 6
Fowey Consols (1858 to '67) (nick'l and cobalt)	8	5	3	0	244 14 11
East Pool (1871 to 1876) (chiefly cobalt)	4	13	3	18	166 0 0

Tungsten—This element exists in the west of England mining area mostly as wolframite (tungstate of iron and man-

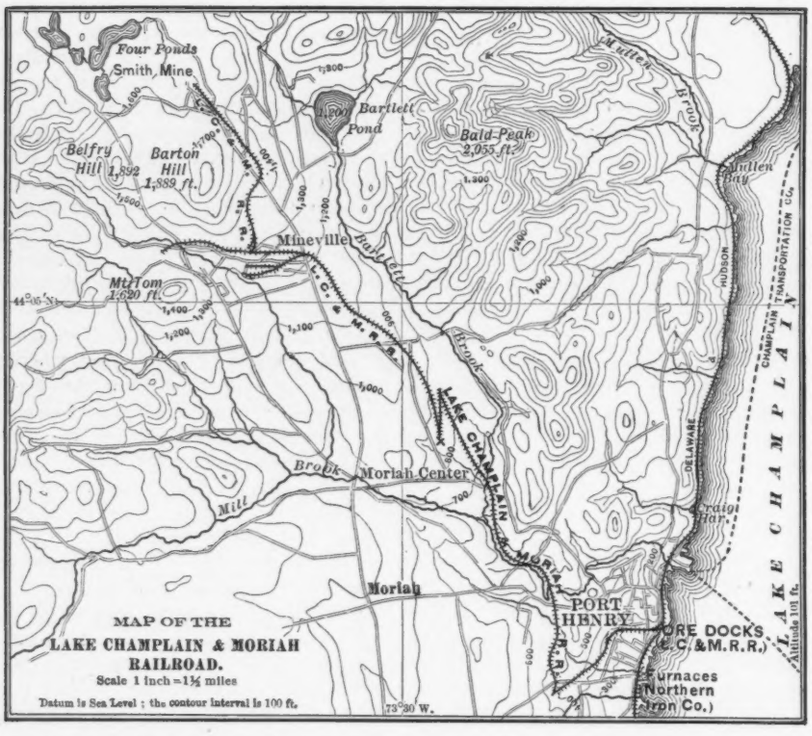
*Consulting engineer, London, England.

[1] "Nat. Hist. Corn.", p. 130.

ganese); it is always closely associated with tin, but far less widely distributed.

From all the lead veins, most of the copper veins, and even many of the tin veins, it is altogether absent; while it hardly exists at all as a rock constituent outside the veins. Yet in the form of wolframite (which contains about 60 per cent. of tungsten) it is locally abundant; as for instance at East Pool, South Crofty, Clitters United, Drakewalls and other mines. Small quantities of tungsten also occur as scheelite and as tungsten-ocher. Still it is probable that, on the whole, tungsten is not more than one hundredth as abundant in the ore-veins of Cornwall as cassiterite.

The commercial value of wolfram was but little recognized until about 20 years ago, although its disadvantages have been



and are still seriously felt by the tin-miner who employs only the ordinary processes of ore-dressing. It is now, however, successfully separated by the Wetherill magnetic separator.

The following sales of wolfram ore (with a little tungstate of soda, once prepared at East Pool mine by the Oxland process) have been officially reported:

Year.	Tons.	Value in £.
1855–1860,	46	312
1861–1870,	130	1290
1871–1880,	298	3223
1881–1890,	1045	16237
1891–1900,	882	30150
1901,	21	408
1902,	9	273
1903,	272	12864
1904,	161	14389
1905,	136a	3350a

Most of this, until very recently, was sold from East Pool or Carn Brea; but not inconsiderable quantities were derived from Wheal Agar and South Crofty; all these mines being situated on the north side of Carn Brea Hill. Other mines which have sold small quantities from time to time, are: Wheal Gorland, near St. Day; Great St. George, in Perran; East Kit Hill; Holmbush and Trebartha Lemarne, near Callington; Herodsfoot, near Liskeard; Drakeswalls, near Calstock; and Bedford United, near Tavistock. Lately the Clitters United mines have been considerable producers. Since 1898 a few tons have also been sold from the stream-tin works.

Besides the mines named, Prospidnick, in Sithney, the Beam and Bunny mines, near St. Austell, and many others have furnished specimens of wolfram, but only small sales have been reported therefrom.

Uranium—Like nickel and clobalt, this has been usually found in lodes containing ores of tin or copper, or in crosscourses near the intersection of such lodes. It frequently occurs as the proto-peroxide (pitch-blende), in which form considerable quantities were formerly raised from St. Ives Consols, Wheal Trenwith, and several of the St. Just mines. The beautiful phosphates known as copper-uranite (torbernite) and lime-uranite (antunite), are both found in Cornwall; the former occurs in groups of thin tabular crystals in the shallow parts of many of the copper mines; and particularly at Wheal Edward (St. Just), Wheal Unity and Wheal Gorland (Gwennap), Wheal Buller (Redruth), Stenna Gwynn (St. Stephens), and Gunnislake, near Calstock.

The hitherto most important occurrence of uranium, however, has been in the north and south lode at South Terras (or the Union mines), near Grampound road. The following statistics of uranium production in the west of England during the last half-century are imperfect, though not perhaps seriously so:

	Ton.	cwt.	qr.	lb.	Value.
St. Austell Consols (1856 to 1863)	0	18	0	19	£ 65 0 0
East Pool (1877–1879)	0	9	3	18	68 0 8
Wheal Owles (1878–1879),	0	5	2	0	50 0 0
South Terras (1873–1900),	323	0	0	0	10590 0 0
South Terras (1901)	79	0	0	0	2932 0 0
South Terras (1902),	526	0	0	0	2028 0 0
South Terras (1903)	mine stopped.				

Molybdenum.—The sulphide (molybdenite) has been found at Wheal Unity and Wheal Gorland (Gwennap), at Drakewalls, and at many other localities but never in abundance, though probably a close search would show it to be pretty widely diffused.

Chromium.—This has only been found in a few specimens, not of commercial value.

Platinum and the platinum group of metals.—These have not been found at all; nor has *Mercury* been found, except, perhaps, as a constituent of some specimen of fahlerz.

All these "less common" metals and metallic compounds are, obviously, "secondary concentrations," or "segregations," or "efflorescences" from older mineral deposits which contained only traces of the substances in question.

The Zinc Corporation.

SPECIAL CORRESPONDENCE.

The directors of the Zinc Corporation have issued their first half-yearly report. Allusion is made therein to the favorable contracts made with the Broken Hill South, Block 10, Block 14, and British Broken Hill companies for the sale of zinc tailing. It is also mentioned that a satisfactory contract has been entered into with Aaron Hirsch & Sohn for the sale of from 10,000 to 20,000 tons of zinc concentrate during the current year, from 20,000 to 40,000 tons during 1907, and 40,000 tons from 1908 to 1911 inclusive. It is stated that the Potter process plant established at the British mine is working satisfactorily, while, as the result of substantial improvements made by the engineers of the corporation, a higher recovery and the production of a better grade of concentrate than previously secured by this process is expected to be obtained. The paid-up capital of the company is £260,000, out of which £90,104 has been expended in the purchase of 394,737 tons of tailing.

The galvanic action between the zinc coating and the steel body of galvanized sheet metal is especially marked in smelter practice where the acid fumes render the action more rapid.

a Estimated.

The Lake Champlain & Moriah Railroad.

BY J. H. GRANBERY.

As the mines at Mineville, N. Y., are some distance from any of the main arteries of commerce (Port Henry, the connecting point with the Delaware & Hudson Company's railroad and with the steamer and barge lines on Lake Champlain is seven miles away), a connecting road has been built through the valley, which handles the entire output of the mines. There are docks at Port Henry owned by the company, capable of storing 100,000 tons of ore. While canal navigation is suspended, during the winter, the ore which is not forwarded by rail is stored for later shipment. About 75 per cent. of the total shipments are made by rail.

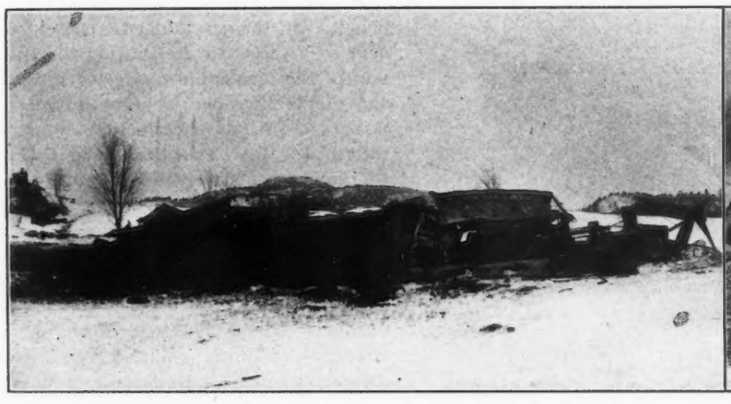


FIG. 2. WRECK AND THE BANK FROM WHIC H IT JUMPED.

FIG. 3. A NEAR VIEW OF THE WRECK.

In 1868 the Lake Champlain & Moriah Railroad was built by Witherbee, Sherman & Co., and the Port Henry Iron Ore Company jointly. The difference in level between the two terminals is 1307 ft. The road is standard gage, and the tracks are laid with 90-lb., Am. Soc. C. E. section rails on white-oak and yellow-pine ties. Tailings from the mine plants are used for ballast. The usual grade is 211 ft. per mile, or about 4 per cent. Train inspection is made at Mineville as soon as the cars are made up, and a furthur inspection is made by the train men before leaving; the steep grades and many curves render this of the utmost importance. The brake equipment also is a matter that demands considerable attention. In operation trains are made up of gondola cars, with the addition of a certain proportion of the "jimmy" cars coupled with them in order that by their greater braking power per ton of load, they may give sufficient retarding action to control the trains. Some trains, however, are made up without the aid of jimmy cars. The newer engines are fitted with two air-pump equipments, a 9½-in. Westinghouse, and an American, respectively. A 5-per cent. reduction of air, it is stated, will stop trains on a 4-per cent. grade. Some $200,000 have been spent on this road in the past five years, with the result of a constantly improved equipment, and lower cost per ton-mile of freight haulage. The present equipment comprises eight engines, 287 cars, and passenger equipment of a limited amount, most of the road's business being freight carriage. The older locomotives are of the Mogul type, coupled 2-4-0 and 2-6-0. A new consolidation engine was put into service in May. This weighs 175,000 lb. on the drivers, or 318,000 lb. complete. The heaviest previously in use weighs 125,000 lb. on the drivers. Hot feed water is taken on, when desired, from the hot well of one of the mine power-houses. This is arranged to feed at the rate of 2500 gal. per min.

The cars used are of three types—pressed-steel gondolas, 10-ton jimmies, and 20-ton jimmies. The first have a capacity of 55 tons, and weigh 26,220 lb. each, a load factor of about 80 per cent. The 20-ton jimmies are new steel cars; 25 have just been delivered but are not counted in the equipment noted; they are now being put in service; they weigh 10,300 lb. each The 10-ton jimmy is the most interesting type, and the brake used upon it has been copied in the design of the new 20-ton steel jimmies. The car dumps through a hopper bottom which is held in the closed position by a simple button latch, secured by a catch. This is released by turning through a right angle with a wrench-bar. The brake is a hand operated long-lever device, that operates on all four wheels and has been found to give higher braking power than any other combination. The cars themselves are of wood, and weigh 7000 lb. each. Fig. 5 shows a 10-ton wooden, and one of the new 20-ton steel jimmies.

The road carries an average of 55,000 to 60,000 tons per month, and sometimes runs to 3,000 tons per day.

An illustration of the grades and difficulties of railroading on a line of this character is afforded by the illustrations Figs. 2, 3, and 4, showing the wreck of a locomotive and seven ore cars on Feb. 16, 1905. On that date a locomotive and seven loaded 55-ton cars started from Mineville on the way to Port Henry. In making up the train, it did not have its quota of "jimmy" cars (the latter being used as a drag on other cars on account of their high braking power) and the ordinary air brake was not sufficient to hold the train when the trouble occurred.

This was the direct result of the breakage of the throttle at the head of a steep grade. The engineer attempted to close it, but was unsuccessful. The train on the down grade was constantly gathering speed, and efforts to retard it by reversing under steam failed. The crew made a hasty attempt to apply the brakes, and then jumped. The train ran entirely without and beyond control for about two miles down a 4 per cent. grade until it reached the end of the switchback shown by a cross in the map of the railroad. At this point, it tore away the bumper and made a leap of 172 ft. horizontally before any part of the train struck the surface. The plan shown in Fig. 4 indicates where the locomotive is believed to have struck. It is certain that no part of the train struck the ground until it had flown, as stated, 172 ft. through the air. Throughout its course down the track, and even in the leap, the entire train was attached to the locomotive. The latter in striking turned directly over and faced the end of the wye from which it had jumped; the velocity of the train unquestionably reached at least 100 miles per hour. The cars are of pressed steel and weighed 29,600 lb. They were designed to carry 100,000 lb., but as stated actually hold 55 tons of ore. They have been repaired, and are now again in service, perhaps the most surprising thing about the accident. The illustrations showing the condition of the locomotive and cars after landing, are published through the courtesy of Geo. B. Strouse, Port Henry, N. Y., to whom I am indebted for the photographs. The engine must have been in back motion for at least a mile and one-half of the phenomenal run, and so far as the surface indications show, must have made a leap of 340 ft. through the air before striking the ground.

There are three wyes of this character on the road; the one where the accident took place, though, is the only one where

the stub-end does not end in a steep up grade; one of the others is at the opposite end of the straight track from the wye where the accident took place, and the other is nearer Port Henry, as will be seen on inspection of the map.

The bridges are few in number, compared with what might be expected of a road traversing such a rugged country. They are mostly of plate-girder type, and are proportioned for the heaviest engines, followed by a uniform train load of 7,500 lb. per lineal foot.

railroad at an elevation, and a connecting spur descends to join the tracks of the latter road. Connection is also made with the ore tracks of the blast furnaces of the Northern Iron Company, which are about half a mile below the Port Henry terminal and docks.

For much of the information contained herein I am indebted to S. F. Lane, general superintendent of the Lake Champlain & Moriah Railroad, who has kindly extended permission to use the data published.

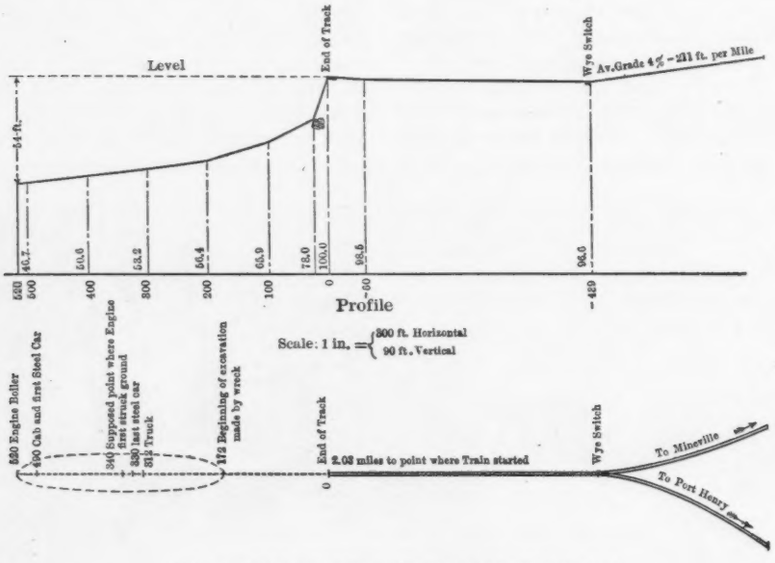


FIG. 4. WYE-SWITCH, AND PLAN OF THE WRECK.

Completely equipped car shops are provided and most of the buildings are grouped at the Port Henry terminal of the road. Here are the machine shop, turntable, water station, smith shop and general office. Practically all repair work outside of the building of new boilers is done upon the ground by the company's workmen. Wheel grinding and other lathes are installed, and the equipment is not excelled by that of many more pretentious roads. The arduous conditions under which the service is carried on render such an investment necessary; the utmost care must be exercised to keep the motive power and rolling stock in perfect condition.

As will be seen by reference to the map, the main terminals of the road are at Mineville and Port Henry, respectively; a spur to the Smith mine is used, however, and a yard system at Mineville permits the track storage of loaded cars and empties, and facilitates to a degree, the work of local transportation as well as the making up of trains. At Port Henry the yard system is not so extensive, on account of the hilly nature of the place, but storage tracks are provided on the wharf previously referred to as well as on the surface. Nine side-tracks are now being built. The tracks to the wharf cross the Delaware & Hudson Company's

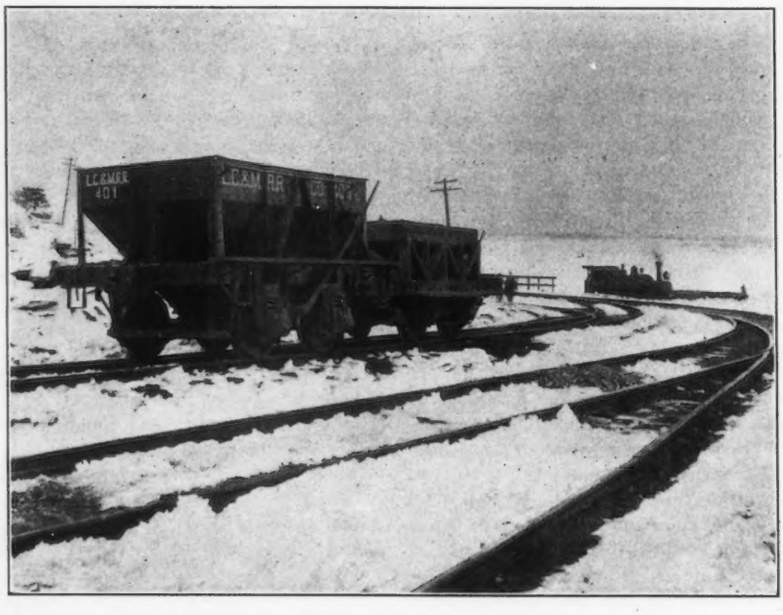


FIG. 5. STEEL AND WOODEN JIMMIES.

Steel Jimmy, capacity 45,000 lb. Wood Jimmy, capacity 22,400 lb.

Nickel in the molten state readily absorbs carbon, and when cast in a chilling mold becomes extremely hard and glass-like; but if cooled more slowly the grain becomes coarse.

Thorium Nitrate.

In January the German "Thorium Convention" decided to kill all competition in thorium nitrate by suddenly dropping the selling price to $6.43 per kg., less 3 per cent. discount, states the Berlin correspondent of the London *Times*. Early in 1894 thorium nitrate was sold at $476 per kg., but dropped in price year by year, being maintained during the period from May, 1904, to January, 1906, however, at $12.61 per kg. The sudden drop spread consternation throughout the gas mantle manufacturing trade. The result has been disastrous to the small thorium works outside the ring with large stocks of high-priced material on hand. Some suspended operations, others went bankrupt, and the "Thorium Convention" was left completely master of the situation.

This leads the correspondent to conclude that the Germans have made a great blunder by their speculative tactics, and have only succeeded in drawing the attention of the mercantile classes everywhere, and of the Brazilian Government in particular, to an industry which they practically had in their own hands, and in which enormous profits were being made. Formerly Germany ruled the market both for the supply of thorium and cerium nitrates and also of incandescent mantles, but now probably the monazite sand proprietors and concessionaires in Brazil and the Carolinas will combine to form an international thorium syndicate, which will deprive Germany of its present predominance in the incandescent gas mantle industry and the subsidiary chemical trade.

Don't put dynamite directly over steam or hot water pipes or other heated metal surface to thaw it.

Arizona and Sonora.—V.

BY DWIGHT E. WOODBRIDGE.*

The Globe District.

The Globe copper district is one of the oldest in Arizona, and was the first to be described in the publications of the U. S. Geological Survey (by Frederick L. Ransome, Prof. Paper No. 12; 1903). Its location is on the northeast foot of the Pinal mountains. Pinal creek drains the district into the Salt river.

The town of Globe (which at present is not incorporated) contains about 7000 people, and is the northern terminus of the Gila Valley, Globe & Northern railroad, a branch of the Southern Pacific system; it is on the western edge of the San Carlos Apache reservation, a district that, once opened for settlement, may be found of great value, from both its ranching and mining possibilities.

Development dates from 1874; and, as usual in the southwestern copper fields, the first search was for silver. Prospectors were scattered all over the district in spite of those twin terrors of the mountains, Geronimo and Victorio, the Apache chiefs; the prospectors opened numerous small silver ledges. These extend for 10 miles northeast from Globe. Many produced upward of $100,000 each; some of them many times as much. The cost of supplies was very great, as everything had to be hauled a long distance, but the rock was rich. In the year 1886, 12 mills and 86 stamps were working on silver and gold ores. Silver production ceased in 1887. In the history of its early years the district was, therefore, quite similar to Butte.

Copper was first mentioned in 1878, though there had been abundant evidence of its existence since the arrival of the first prospector. The Old Dominion was organized about that time, to operate a property four miles from Globe and entirely distinct from the present mines of the company of that name. In 1886 it was bought by William Kayser, of Baltimore; at that time, it was making ten tons of black copper daily, and from one furnace. The United Globe was organized in 1892.

In 1895 the Old Dominion was reorganized and was purchased by Messrs. Bigelow, Hyams and others, well-known copper factors. A majority of the company's stock was bought in 1903 by the well-known firm of Phelps, Dodge & Co., which owned the adjoining United Globe mines, and desired to utilize the Old Dominion ores in its smelters in other parts of the Territory. A consolidation of the Old Dominion and United Globe mining companies has been in contemplation for some time and may be effected soon; the unwarranted suspicion of smaller stockholders has been instrumental, hitherto, in holding it in abeyance. Very recently a proposition for the purchase of a majority of Old Dominion Copper Mining and Smelting Company stock by a new and important copper interest has been under consideration; but it has not been consummated, and now is not likely to be. At times prior to the ownership of control of Old Dominion by its present management, the company had been under suspicion of being more or less of a stock-market plaything, but no taint of the manipulator attaches to any of the operations of Phelps, Dodge & Co.

SMOKE FROM RECENT FIRE IN OLD DOMINION MINE.

Dr. Ricketts, the manager, is credited with a remark to the effect that there is ten times as much ore exposed in the Old Dominion as when the present management took hold. During this time, also, the mine has been entirely rebuilt; old main drifts have been abandoned, and new ones have been run in solid ground. There are now 20 miles of underground workings in the property.

In 1904, the Arizona Commercial Copper Company became a copper-mining concern. Its shipments were irregular, and entirely in the way of development work, till last October, when a contract was made with the Old Dominion for 50 tons or more per day. This contract has permitted continuous shipments since that time, and of late the production under it has averaged fully 100 tons per day, of excellent sulphides. In addition to this, it is shipping about 50 tons per day of silicious carbonate ores to the Cananea works of the Greene company. During this period the company has been developing far ahead of its shipments. While its operations may be criticized somewhat (by the use of the word "gophering," inasmuch as it has opened a number of shallow surface deposits which it is mining in a small way, and from which it is taking out more or less of a surprisingly good quality of copper oxides), yet it is also doing a large amount of deeper development. Its Copper Hill shaft is down between the 700- and 800-ft. levels; and development is proceeding on the 700-ft. level, where it has exposed high-grade ores, both sulphide and oxide. Its Black Hawk shaft is down nearly to the 400-ft., and is de-

* Mining engineer, Duluth, Minn.

veloped on the 300-ft. level. Large ore-bodies have been cut. It is stated that there are 13 good sized stopes in the underground developments of the company from which no mining is now going on.

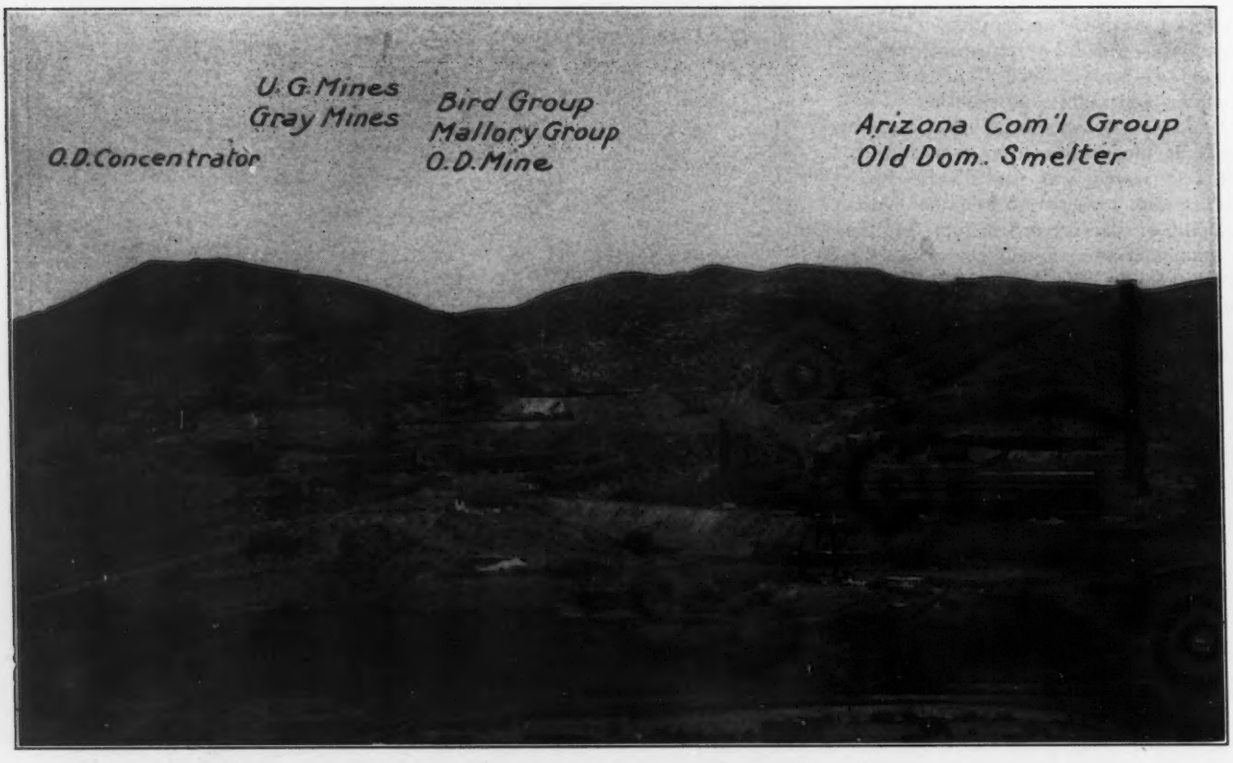
The Arizona Commercial is unfortunate at present, in the long and expensive tram for its ores to the Gray ore-bins of the Old Dominion, from which it is taken to smelter and railway tracks; this tram is about two miles long. It so limits the capacity of the mine that little more ore can be moved forward than the tonnage now shipped. It is reported that railway connection is to be made soon; but no active step in that direction has been taken, and a road will be rather expensive.

The company's smelter is now being enlarged by a fourth large blast-furnace, and a reverberatory to care for a large accumulation of old, and the daily production of new, flue dust from the furnaces.

Geologically the oldest rocks of the district are the Pinal, or pre-Cambrian, crystalline, schists; a series of fine sandstones and slates, metamorphosed. Above these are quartzites and limestones, similar to the associated rocks of the Arizona series at Bisbee. At the close of the deposition of limestones, the district was eroded and then extensively faulted. Nearly contemporaneously were intruded great sills of diabase, which lifted up the quartzites and limestones. Later additional faulting occurred, and mineralization took place. These rocks and their effect are similar to the granite-porphyry at Bisbee. Ores of the district occur along faults, and there is an invariable association of ore-bodies with diabase. This makes it easy to explore intelligently; and the comparison of this part of the mineralized area with that of Bisbee, (where the replacement has occurred in not quite so orderly a manner) is quite striking. Later the country was covered by great dacite flows. These have been in large part eroded, but they still show at many points. A later series of faults had no effect on the original mineralization; but in many cases, as at the great Old Dominion fault and elsewhere, they reopened the ground and permitted renewed enrichment action. The Gila conglomerate, which overlies the older rocks, is younger than the corresponding Glance conglomerate at Bisbee. But the entire series of rocks is essentially similar to that at Bisbee, and both are typically Arizonian.

Among the many faults of the district, that one called the Old Dominion has the greatest measurable throw, and is best developed. It is opened for more than a mile in length, and has produced ore for that distance, though not, of course, continuously. It has a throw of above 1500 ft. Another lies north of the Old Dominion, has been traced for three miles, and is known to be mineralized for a long distance. It does not show in the illustration. The chief faults are the Old Dominion, the Aztec, Josh Billings, Bird, Buckeye, Arizona, Stonewall, Kearsarge, while many smaller are easily discernible. All these faults have produced ore; nearly all of them have an approximate northeast-southwest trend and show surface mineralization. These show not copper alone, but many small though excellent silver lodes are also found as work progresses; while the copper showings are frequent and of excellent grade. The throw of the south faults is to the south, and varies up to 1500 ft., as in the Old Dominion; while the throw of the north faults is to the northwest. It is evident that the diabase acted as a buttress, throwing the faulting.

A second series of faults is north-and-south, while the later ones cut across northwest and southeast. Nearly every one of the earlier faults shows extensive



OLD DOMINION MINE, MILL AND SMELTER.

In the western and northern part of the district there are a number of copper properties now quite active, and which ship almost exclusively to the Old Dominion smelting works, by team. These include the Inspiration, the Copper Mining Company, the Live Oak, the Gibson, the Eureka, and the Black Warrior; the last was, for a long time, a sufferer from badly planned operations, but has now discarded its former methods and is a small but fairly successful producer.

Up to the close of 1905 the district produced about 180,000,000 lb. of copper, of which 60,000,000 lb. has been won in the last four years. The Old Dominion, in each of the past three years, has doubled its copper output as follows: In 1902, 7,479,721 lb.; in 1904, 15,338,147 lb.; in 1905, 28,888,000 lb.

mineralization, but most of them are exploited to but shallow depths. No one has ever gone to 1000 ft. at Globe, and the possibilities of the district at depth can, therefore, be but surmised. There is reason to hope that faults may widen and carry large bodies of secondarily-enriched sulphides (as indeed the deeper levels of the Old Dominion are beginning to show), and that the future of the camp may prove far more important than the past.

The occurrence of oxidized ores is in the form of malachite, azurite, cuprite, chrysocolla and some native copper, usually associated with hematite and limonite and occurring in leached, clayey masses resulting from alteration of the limestone, or in shattered quartzites as thin films between fragments, also as replacements.

In the deeper levels, sulphides occur as chalcocite, chalcopyrite, cupriferous pyrite, near and below water-level. On the 12th level, of the Old Dominion mine (800 ft. down), the ores are sulphides with much native copper and cuprite. Streaks of pure glance, up to 2 ft. wide, occur. All this shows the important action of the oxidizing waters at that depth, and to what extent the formation was shattered by faulting and refaulting. These sulphide ores are of the utmost importance to a district such as Globe, which is essentially silicious, and where there has been, and still is, a sharp demand for all sulphide ores. These ores are a new product of the camp, on account of a lack of earlier development on the lower levels.

The ore is distributed as follows: Firstly, the largest continuous ore-bodies lie contiguous to fault-planes between diabase as a foot-wall and the sedimentary series of quartzite, overlain by limestone and underlain by diabase; these run as irregular ore-bodies into the limestone. Secondly, ores occur in the shattered quartzite, impregnating it and replacing it in irregular masses. Thirdly, ore occurs as distinct lode-deposits in the underlying diabase. These diverse classes of ore-bodies (making, in fact, three series of lodes) are connected in a way, for the lodes in diabase run into the replacements in quartzite above them. These ore deposits may be said to be similar, in part, to the Butte veins, in part to the Bisbee replacements, while in part they are unlike either. They are neither distinct lodes alone, nor solely replacements, but connect the one with the other. They grade upward from ores in diabase against diabase, through quartzite against diabase, quartzite against quartzite, quartzite against limestone, diabase against limestone, and limestone against limestone.

One ore-body in the Old Dominion is 200 ft. long by 100 ft. thick by 60 ft. wide, and was mined when nothing less than 10 per cent. copper was considered ore, everything under that being regarded as waste or country rock. In this connection it may be interesting to learn that the old stopes of the Old Dominion have been mined out at least four times; first, when coke was worth at Globe about $45 per ton, and the furnaces made black copper from 25 per cent. and higher ore, and when lower grades were used for filling the mined-out sets; secondly, when better transportation and metallurgical practice made it possible to use ores running many points lower, and when these old gobs were reopened and taken to the smelter; thirdly, when still lower costs permitted this to be done once more on the second back-filling; and now and fourthly, when high-grade operations admit the use of ores running less than three per cent. Present filling is of a character that will probably never permit a fifth reworking of the same stopes. There is one body of cupriferous iron ore in the limestone that has been followed to a distance of 2000 ft. and that has a diameter of, say, 100 ft. There is one mass of quartzite impregnated with copper, in the larger part rich enough to make merchantable ore, for 1200 ft. by 100 ft. by 200 ft. Practically all of this great ore-body is good enough to go to the furnaces, either as ore or converter-lining. Below the 10th level, 650 ft. from surface, sulphides have been developed in veins up to 650 ft. long and up to 40 ft. wide, running from the 10th to the 12th level, and still persistent at that depth.

Neighboring mines, like the Live Oak, Black Warrior, Inspiration and Gibson, contain much chrysocolla, which occurs both as bluish-green brittle mineral very rich in copper, and as an almost black ore, from the presence of much mangan-

THE FAULT SYSTEM AT GLOBE.

ese. A considerable percentage of this silicate of copper, which is brought to the Old Dominion smelter by teams, carries as high as 25 per cent. copper.

Neighboring mines, like the Continental of the Old Dominion company, the Gibson, Live Oak, Inspiration, Black Warrior and Eureka, add considerably to the district; and at this time, when the lower levels of the Old Dominion have been out of commission, they are especially important for its works. Most of these mines lie from five to ten miles east of Globe. The Continental contains an immense body of red oxide of copper and hematite, looking not like a copper mine but like iron alone; in the furnace it shows its value, for the copper comes out from 10 to 15 per cent. Some 10,000 tons are exposed, and shipments are now going forward as fast as teams can be found to transport the ore.

The Gibson is 18 miles from Globe. Its daily shipments are about 30 tons of an enriched sulphide ore running better than 20 per cent. copper. With its long haul over bad roads, a smelter deduction of 10 per cent. for moisture, a charge of 10c. per unit for excess insolubles, a deduction of 3c. from the New York price of electrolytic copper, and a treatment charge of $4 per ton—with all this, the mine is making money and increasing its development rapidly, till it looks as though it had the making of an important property. On its 22 claims, the Gibson has, perhaps, 4000 ft. of development openings.

Live Oak leasers ship 150 tons per day of chrysocolla to El Paso and Old Dominion smelters. Of its production, about 15 tons run better than 15 per cent. copper; the rest from 8 to 12 per cent. This mine is peculiar in that there is found, in kidneys along the walls, a novel copper ore, a hydrated silicate, which is used in the neighborhood as a jewel, and has quite a striking turquoise-blue appearance. At points through the mine, where hydration is in progress, this ore can be seen forming. It is rather rare, however, and is considered a curiosity. This mine has up to 180,000 tons of ore exposed; according to report, all of good grade.

The Inspiration ships about 50 tons per week (depending on teaming conditions) of a high-grade sulphide ore containing much glance. It has just commenced shipments in a small way, but is arranging to erect a reduction plant. The ore is in stringers in a wide deposit of silica, which breaks down easily and can be concentrated cheaply. There are said to be 5,000,000 tons of this concentrating ore in sight. All shipments now are from the rich stringers.

The Black Warrior ships about 50 tons per day, chiefly to the El Paso smelter. It is a sulphide which averages from 8 to 12 per cent. copper. As in the case of other and adjacent mines, the cost of hauling runs up to $4 or $4.50 per ton, and the mine must make shipments of high-grade ore. This mine has been unfortunate in its early development, but is now improving its condition.

The Eureka ships a silica conglomerate to Douglas smelters for use as converter lining. Its copper tenor is from 5 to 7 per cent. It is a peculiar ore; the only similar deposit known in the district is at the Keystone. Streams, flowing out of the hillsides at this mine, are strongly impregnated with sulphate of copper, leached from the ores beneath; and as this water is redepositing its copper burden in the silicious conglomerate, the process of copper-making is going on in open sight continually, as the result simply of topography and the character of the underlying ores.

The Works of the United States Zinc Company, at Pueblo, Colorado.*

BY O. PUFAHL.

The smeltery is situated near the old Indian village from which the town of Pueblo takes its name. It was erected in 1903, with the coöperation of the company operating the zinc works at Overpelt, Belgium, by the American Smelting and Refining Company, and its special function is to smelt the blendes obtained by dressing the silver-lead ores of the mines of Leadville, Creede, and elsewhere in Colorado. As these blendes are very similar in composition (40-45 per cent. zinc, 15-20 per cent. iron, 7-8 per cent. lead) to those worked up at Overpelt, the smeltery was built entirely on the same plan as that at Overpelt.

The blende is crushed to 2 mm. size, and is roasted in four Rhenania furnaces of 35 tons aggregate capacity and one Hegeler furnace 70 ft. long, which takes a daily charge of 40 tons of ore. The sulphur left in the roasted ore is 1.5- 2 per cent.

In the distilling plant there are six furnaces, each with 240 retorts, arranged in three rows, heated by Siemens regenerative firing. The gas is produced in Duff generators, which consume 1.1 ton of coal per ton of ore charged. Each furnace receives a charge of 10.5 tons of roasted ore, mixed with 45 per cent. reducing coal. The yield of spelter is said to be 88 per cent.; in isolated cases it is stated to have even reached 92 per cent.

An outside glaze of a mixture of powdered glass and concentrated sodium silicate solution, which is given the retorts (made in a hydraulic press) is unquestionably not calculated to render them more durable, but it does increase the yield of zinc. Owing to the high iron content of the charge, it happens not infrequently that molten highly carburetted iron separates out in the retorts, much to their detriment. The condensers are provided with prolongs, the comparatively small quantity of blue powder collected by which is added to the next charge for the furnace. The fritted residues are removed from the retorts by hand; they drop into the vault under the furnace. For this operation the traveling screen is brought up to the particular furnace, and also when drawing out the zinc into the iron ladle (attached to the screen).

The crude spelter contains 2 per cent. lead and 0.05-0.06 per cent. iron. By refining it in iron kettles provided with a hole for tapping the lead, a refined spelter with 0.02-0.03 per cent. iron is obtained. The residues from the retorts contain 3 to 5 per cent. zinc, 10 per cent. lead, and a little silver and gold. They are to be concentrated together with broken-up muffles and receivers in a dressing plant, which was not yet in operation at the time of my visit, and the product is to be handed over for further treatment to the Pueblo lead smelters of the American Smelting and Refining Company.

[1] Translated from *Zeit. für Berg-Hütten u. Salinenwesen im Preuss. Staate*, 1905, LIII, 438.

Tin Production in the Black Hills.

SPECIAL CORRESPONDENCE.

Tin ore from Gertie mine, one of the old Harney Peak properties, located at Hill City, South Dakota, has been successfully smelted in an experimental way, the metal product assaying 99.9 per cent. tin, with only a trace of antimony. The experiments were made under the direction of E. C. Johnson, who owns the Gertie mine. The ore used in the tests was taken from the 500-ft. level. It was crushed by a Blake crusher, and a one stamp mill, concentrated on a Wilfley table, and smelted in a reverberatory furnace.

The shaft of the Gertie mine has now reached a depth of 500 ft., and drifts have been run on each level. Three strong and well defined veins have been developed. One of them is from 3 to 5 ft. wide and about 200 ft. long on the surface, where it carries 1 per cent. tin. Between the third and fourth levels, however, it carries as high as 3 per cent. tin, showing the tendency of these deposits to increase in value with depth. Another vein is from 3 to 6 ft. wide, and three-quarters of a mile long. Only a little development work has yet been done on this. Assays of samples from the outcrop have shown 1.5 per cent. tin. A third vein is a blind lead, which was cut at a depth of 480 ft. At the 500-ft. level this widened to a vein of 8 ft., carrying 3 per cent. tin.

The black tin contained by these ores is a fairly pure oxide, being free from wolframite, columbite, arsenic, etc. It occurs in greisen, but in part of the veins in pegmatite. The concentrates assay about 67 per cent. tin.

Zinc-Ore Mining in Wisconsin.

STAFF CORRESPONDENCE.

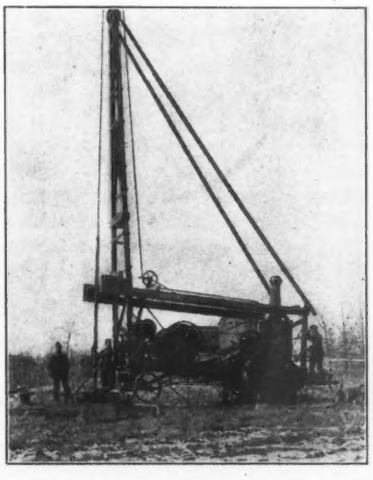
Although mining has occured in this region for a long time, it is only within the last few years that the principal development has been accomplished. Before 1902, owing to the large amount of iron in the ore, concentrates brought very low prices—$20 or thereabout per ton—so that only those large sheet deposits of zinc blende free from lead and iron could be worked at a profit. By cobbing and hand-picking a poorer ore it was possible to get a high-grade product, but so much ore had to be broken and wasted that even this was no great incentive to mining zinc. But upon the successful application of magnetic separation to these ores it became possible to wet-concentrate the ores and then separate the iron sulphide from the jack magnetically. This made any kind of a zinc deposit available for the market since it was no longer necessary for an ore to be free from iron. Since then numerous new mines have been developed. They are just beginning to produce so that mining methods are in a very chaotic stage. Most of the orebodies are but little developed, so that not much is known about their extent. Many of the older mines, however, as the Mason at Linden, and the Grunow at Miffin, have been worked for years.

The deposits are all shallow so that hoisting and pumping do not cost very much. Besides, very little timbering is required. The orebodies generally lie within 150 ft. of the surface so that prospecting is cheap. The ores are easily saved by wet concentration, and subsequent magnetic separation renders them available as high-grade zinc ore, without the necessity for expensive plants either for mining or for dressing them. All these things make the field a very alluring one and account for the great excitement.

PROSPECTING.

Churn drilling is the usual method of prospecting for ore. All kinds of churn drills are operating in the camp. These do not have to be expensive because it is rarely necessary to drill over 150 ft. in depth. Such churn drills cost from $400 to $1000 according to the make. The hole drilled is usually of 6 in. diameter and costs, on contract, 75 to 85c. per foot up to a depth of 150 ft.; from there on it costs about 90c. a foot up to 200 ft. and $1 at a depth of 200 to 250 ft. The driller furnishes all the casing required to put down the hole, but the person paying for the drilling has to pay for any casing that can not be pulled out when the hole is finished. About 20 ft. can be drilled in a day. A drilling log is kept of each hole, the hole being sludged out frequently. When the ore horizon is neared the hole is sludged out every 18 in. By firing some dynamite in the bottom of the hole it is possible to break the jack up into large chunks and bring out large enough pieces to see whether the ore is a disseminated or a sheet deposit. This is rarely done because it endangers the walls of the hole and may necessitate putting in casing. Three sizes of casing are used, 6, 5⅝, and 4 in. diameter.

Churn drilling is an unsatisfactory way of prospecting, for not only does it render salting an easy matter but it also allows one to salt himself unintentionally with the jack falling down from the sides of the hole. Malicious salting is guarded against by sludging out the hole thoroughly before quitting, then placing a piece of board or sheet iron over the hole and letting the drilling tools down on the top of this covering. As the tools are heavy it renders the salting of a hole while the driller is gone very difficult. Before starting up in the morning the hole is again sludged out so that any attempt at salting would be detected. Of course the value of the hole depends mostly upon the honesty of the driller. On the whole, churn drilling furnishes an indication of the presence of ore, but no accurate evidence of its thickness, etc.



PROSPECTING WITH KEYSTONE DRILL.

Some diamond drilling has been done in the district but it is not popular owing to its high cost—$3 to $3.50 a foot for a 2-in. core. Longyear & Hodge, of Marquette, Mich., have done some drilling near Cuba City, near Linden, and at the Ellsworth mine near Rewey. Diamond drilling has not been satisfactory because not more than 60-80 per cent. of the core can be obtained in this rock, while owing to the numerous crevices, loss of carbons is excessive.

Core drilling with shot drills has been tried. At Elizabeth, Ill., a core was put down 300 ft. by a Preslar-Crowley drill. No trouble was experienced in crossing the crevices, nor in obtaining a core, but the machine was too light for drilling so deep. The cost for the first 100 ft. was only about $1.25 a foot, but beyond that, owing to the frequent breakages, etc., the cost averaged about $2 a foot.

The Cyclone company is experimenting with an attachment by means of which a Preslar-Crowley shot-drill can be used in conjunction with its drill so as to get a core. It is proposed to churn down until near the jack-ore horizon and then to continue by means of the shot-drill and obtain a core. It is hoped that this will prove a success for then it would be possible to get a core cheaply.

The general procedure in prospecting is to get a lease on some farm. The terms of this lease are that mining operations must begin before a certain date and must be continued for nine months each year with at least so many men, and that a 10 per cent. royalty must be paid the owner upon the ore marketed from the mine. This royalty is 10 per cent. in almost all cases although in a few instances it is only 8⅓ and in others as high as 12½. In some cases a premium is paid for the lease, but generally there is none.

After having obtained a lease and having it duly executed, one starts to "spot" his holes. This is done by choosing a point on some lead range. Drilling is done promiscuously until jack is struck in some of the holes. A sample of each of the sludgings is panned each time; the hole being sludged out frequently. After jack has been found the hole is sludged out every foot. While the pannings show jack, the sludgings, which have been put into a pail to settle, are dried and a sample is taken to be assayed. From these data the thickness of the sheet, or the percentage of the zinc in the ore if disseminated, can be approximated.

After finding jack in one hole, another hole is sunk about ten feet from the first, until the general run of the deposit is ascertained; then the holes are drilled farther apart.

As in a great number of deposits running east and west the north pitch is either wanting or much less important than the south pitch, it is safer to drill directly under an old lead range and a little south of it than to the north. By studying the stratigraphy of the country, the depth necessary to drill to reach certain horizons can be approximated before any drilling is done and the cost of the prospecting can be estimated. Drilling frequently stops at oil rock, but it ought to be continued through the glass-rock of the Platteville on account of the frequent occurrance of jack as low as that horizon.

SHAFT-SINKING.

For opening a deposit, vertical shafts are most popular because they permit the use of Cornish pumps. These are usually of two small compartment 5x9 or 5½x9½ ft. in the clear. In one compartment are the pump, air pipe and ladder way, while in the other, which is 5x5

or 5x5½ ft., hoisting is done with buckets. Most often, copious water is met in sinking these shafts, so that their cost varies from $15 to $35 per foot, according to the amount of water met.

The following costs, given by Messrs. Trego & Brooks, show the cost of three shafts of which very complete accounts were kept.

Shafts	Platte.	Edgerton.	Square Deal.
Size, ft	6 x 9	5½ x 9	5 x 11
Total depth, ft	145	153	73
Total time, days	102	85	52
Foreman wages, per month	$125.00	$125.00	$100.00
Miners, per day	$2.00	$1.75	$2.00
Topmen, per day	$1.75	$1.75	$1.75
Coal, per ton	$3.80	$4.40	$4.25
Coal used, tons	170	91.5	.....
Depth of timber, ft	19	30	30
Water level, ft	65	85	73
Water per min., gal	600	400	Nil.
Powder, per lb. c	12.5	13.5	11.5
Powder, per cent	30	40	30
Depth sunk with machines, ft	....	63	..
Depth mined by hand drilling, ft	145	90	73
Cost per foot:			
Labor	$20.50	$14.54	$14.05
Coal	4.47	2.64	.....
Powder and fuse	1.33	1.10	0.99
Oil	0.05	0.08	.....
Candles	0.10	0.09	0.06
Lumber	0.33	.....	1.40
Miscellaneous	0.64	1.21	.....
Total cost, per foot	$27.42	$19.06	$16.50
Progress per day, ft	1.42	1.8	1.4

At the Platte and Edgerton shafts Cornish pumps were used.

At the Ross mine near Linden a 6½ x 12-ft. shaft was sunk by hand, using a Prescott sinking pump, with 3-in. discharge, 4-in suction. The shaft was not very wet, making only 10 to 12 gal. per minute, but the water was met within ten feet of the surface. This shaft is 75 ft. deep and it took 18 holes to break one round, a V center-cut being taken. The shaft was sunk by day's pay at $2 for an 8-hour shift. It cost $1700, or $22.65 per foot. As a further example I may cite the Sunset mine. This shaft is 180 ft. deep and 6 x 9 ft. in the clear; its hoisting compartment is partitioned off from the vertical ladder way. This shaft is double cribbed for 30 ft., or down to solid rock It was sunk by hand drilling. A center cut, requiring six 4½-ft. holes, was broken first and then 12 holes more were needed to square it up. It took about 1½ shifts to drill the round and 1½ shifts to muck it out. It required 70 sticks of 1⅛-in. 40 per cent. dynamite to break a round. A 12-in. Cornish pump was used in sinking. The shaft cost about $17 per foot.

Near Highland, a 4½x6-ft. shaft was sunk 70 ft. for $300, or $4.30 per foot. This was done by hand and there was no water to pump. Near Mifflin, a dry shaft 5x8 ft. was sunk on contract for $10 per ft.; the company erected the necessary hoister. Near Rewey, a 5½x9-ft. shaft was sunk on contract for $22.50 per ft.; the company erected the machinery but the contractor furnished powder, caps and fuel.

The Platteville-Linden Company has inaugurated a new system of shaft sinking. Two 6-in. holes were churned to oil rock, within 2 ft. of the place to be occupied by the shaft, and two Smedley steam pumps were put in the shaft. This shaft, 6x10 ft., is now being sunk by hand. It had to be cribbed for 40 ft., until solid rock was reached. The cost is about $12 per foot. Every 4 or 5 ft. it has been necessary to drill into the drill holes at the side so as to let the water to the pump. A pipe with a screen over it is then put into the lateral hole to keep sand out of the pump. It takes 16 to 18 holes to square up the shaft and two or three shifts to take out a round. Little trouble is experienced in keeping down the water except when in very compact strata.

Shaft sinking is thus seen to be comparatively cheap, as no timbering is required except some 3-in cribbing down to solid rock 30 ft. or so below the surface. From there on, only a partition between the two compartments is necessary.

PUMPING.

Almost all pumping is done with Cornish pumps. Three types are in general use: The walking beam; the cross-head; and the grasshopper. The water met in some of the mines is quite heavy—up to 600 gal. per minute—so that there are several 16 in. walking-beam pumps in the district. The water can all be used in mills; in fact most mills have ponds to catch their waste water so as to use it over again. The amount of water varies greatly during the year, being much larger in winter than in summer. Mines in the southern part of the district have more water than those in the northern part, for they are deeper.

CORNISH PUMPS IN THE WISCONSIN ZINC-LEAD DISTRICT.

MINE.	PLACE.	HOURS PER DAY.	SIZE OF BARREL.	STROKE.	R.P.M.	TYPE.	H.P.	HEAD.	POWER.
King Bee.	Hazel Green.	24	Single-16″	4′	..	.....	..	75′	Gasolene.
Square Deal.	" "	24	Double-12″	..	..	Cross-head.	50	95	Steam.
Kennedy.	" "	24	Double-10″	6	14	Cross-head.	22	....	.....
Coltman.	Benton.	2	Single-10″	3		Cross-head.	20	70	Steam.
Coker.	Rewey.	24	Double-12″	..	..	Cross-head.	30	75	Electricity.
Sunrise.	"	8	Single- 3″	..	..	Cross-head.	..	75	.....
Sunset.	"	..	Single-12″	..	..	Walk'g-beam.	30	130	Steam.
Empire.	Platteville.	5	Double-18″	3	20	.....	..	....	Steam.
Grant County.	"	24	Double- 8″	5	14	Cross-head.	..	150	Steam.
Hibernia.	"	12	Single-16″	3	8	Walk'g-beam.	..	....	Steam.
Great Northern.	"	24	Single-14″	3	9	Walk'g-beam.	50	160	Steam.
St. Rose.	"	4	Single- 8″	3	..	.....	10	45	Electricity.
Mason.	Linden.	5-9	Double-10″	4	..	Cross-head.	..	80	Electricity.
Ross Bros.	"	10	Single-12″	..	..	Walk'g-beam.	12	75	Steam.
Highland.	Highland.	..	Single- 5″	..	..	.....	7½	....	Electricity.
Baxter.	Cuba City.	4-5	Single- 8″	..	..	Cross-head.	25	60	Steam.

HOISTING.

The head frames are all of the same general type as used in the Joplin district—derrick frames. The hoister is located high up in the frame so that the bucket can dump directly into the bin. This permits the hoister man also to dump the bucket. When this derrick frame forms part of the mill building, as it does in the majority of cases, the bucket is dumped, by hooking a rope into a ring in the bottom, directly into the mill-bin. When the mill is situated at some distance from the mine, as at the St. Rose, the Empire and the Mason mines, the mill is always situated on lower ground. The bucket then dumps into a hopper from which the ore is drawn into a car and run by gravity to the mill. The car is then hauled back by a hoister. These cars have an automatic unlatching device in the rear door and they dump as soon as they reach the mill bin.

These hoists are all very small and are run by steam or electricity or in a few cases by belt from gasolene engines. They generally have a 24-in. drum, and a ½-in. or ⅝ in. wire rope is used in hoisting. The buckets have straight sides and hold from 500 to 1000 lb. of jack ore. They are unhooked and placed on trucks at the bottom of the shaft to be run to the ore pile and filled. No cages are used in the district; the mines hoist small tonnages and only from shallow depths, so that it does not pay to have cars and cages in the vertical shafts.

Several of the mines, the Square Deal and the Kennedy near Hazel Green, the Coker and the Sunrise near Rewey, and the Mason (in one of its workings) near Linden, have been opened by inclined shafts. Cars are there used for hoisting. They are fitted with an automatic unlatching device for opening the rear door when the mill bin is reached. They hold about one ton of ore.

MINING.

Most of the drilling is done with air drills. These are of all sizes and all makes, Ingersolls being perhaps the most popular. Apparently 2¼-in. machines will drill just as much ground as a 2¾-in. machine, for the ground is comparatively soft. About 60 ft. of holes are drilled and blasted in an eight-hour shift. This necessitates setting up two, or possibly three, times. Whatever the size of the drill two men are used upon it.

All mining is done advancing except in the Kennedy and the Highland mines where considerable development work is already done, making it possible to mine both these orebodies retreating.

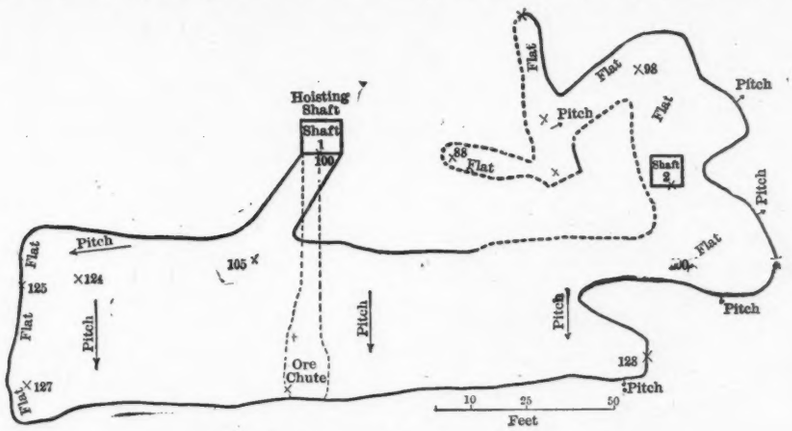
Taken as a whole, the mining is in a very crude stage. No development work is being done and there is no provision for the future. The only idea is to gouge

out the deposit as fast as possible. Labor is unsatisfactory as there are few experienced miners in the district. Eight hours constitute the usual working day. Wages for muckers range from $1.65 to $2.. Double-jackers are paid from $1.75 to $2; Machine runners, $2. to $2.50; and helpers, $1.75 to $2.25. Probably when mining becomes more strongly established in the district, many miners will come from the iron and copper regions of Lake Superior. The district is well supplied with railroad facilities and there are two well equipped machine shops and foundries in the district so that repairs can be quickly obtained. The roads are fair except while the frost is leaving the ground.

The mines are safe to work in at present, for underground work has not extended very far, but it seems probable that if mining continues by its present methods, the roof will begin to slab off after a while, with disastrous results. Mining retreating is undoubtedly the safest way to work these deposits. In the advancing method the waste has to be handled twice, and in most cases pillars of ore have to be left, timbers used or else the waste piled up into pillars any of which methods is expensive, while in retreating the waste can be left behind and no pillars, etc., are required. By mining retreating a lot of development is required but this can be paid for by the mine itself; for after leaving a good sized shaft-pillar one can begin to open up a room or two and mine the ore-body so as to pay expenses while a drift is being advanced. This drift, in a sheet mine should follow some strong pitch, if possible. When it has advanced far enough, mining near the shaft can be stopped and the orebodies mined retreating, with no danger from caves.

This fear of trouble from mining advancing is not ill founded. A cave has already occurred at the Highland mine, where a considerable area had been undercut. At the Lewis mine the ground has caved to surface underneath the mill owing to the cutting away of too much from the shaft pillar. At the Coker mine already the ground has begun to scale off in immense slabs. Several falls of ground have already occurred in the Empire mine near Platteville.

At present many of the mines are being worked only one shift and that is true of nearly all mills. To mine the ore most economically it will be necessary to run mine and mill both day and night. These ore-bodies can be mined cheaply and the ore is easily concentrated. At present most of the working mines are producing ore at about $8 to $14 a ton not including interest or depreciation. A 6-in. sheet of solid jack ore will pay a good profit when mined in a breast 6 ft. high. It would be best in mining such a sheet deposit to break down the waste rock first and then the ore, on a clean floor. Another thing neglected in this district is a floor for the shovelers. Sheet iron soon pays for itself when used as a shoveling floor in place of a rough bottom.



MAP OF THE ENTERPRISE MINE AT PLATTEVILLE.

Rock walls of workings shown by full lines; filled walls by broken lines. Figures near crosses indicate approximate distances, in feet, from surface of ground at top of hoisting shaft. (From report of Wisconsin Geological and Natural History Survey).

ST. ROSE MINE, PLATTEVILLE, WIS. DERRICK FRAME.

Taken as a whole, the district is a very enticing one. Prospecting is cheap, large outlays of capital are not necessary either for mining or milling, and the ore is of a high percentage of zinc compared to the Joplin ore.

ORE BUYING.

The concentrates from the mills are bought by buyers from the different zinc smelters. There are six such companies: The Mineral Point Zinc Company, Illinois Zinc Company, Matthiessen & Hegeler, Sandoval Zinc Company, Grasselli Chemical Company and the Joplin Separating Company. Matthiessen & Hegeler, and the Illinois Zinc Company, are the buyers of high-grade material and so get most of the roasted concentrates, while the Mineral Point, the Joplin Separating Company and the Grasselli Chemical Company are the low-grade buyers.

Buying is done by bidding for the ore but the regular procedure is about as follows: They settle for the jack ore at a certain price for ore carrying 60 per cent. Zn and 1 per cent. Fe with $1 per unit variation up or down, while a penalty of $1 is made for every unit of iron above 1 per cent. The basis of reckoning for drybone is about $10.50 for 30 per cent. zinc and 65c. per unit premium above that. These prices are at mill bin.

New Copper Deposit in Ontario.

SPECIAL CORRESPONDENCE.

An interesting copper deposit has been recently discovered near Dean Lake Railway station, on the Canadian Pacific, in the township of Thompson, on what is now known as the Leizert mine. The ore occurs at the point of contact between a trap dike, bearing inclusions of granite and quartzite, rounded and angular, and clay slate. Both the slate and the trap are impregnated, for a width at present unknown, with chalcopyrite, which is accompanied by calcite, and carries small values in silver and gold. The calcite appears to be in sufficient quantity to form a fusible mixture with the silicates of alumina and iron, and a smelting test already made demonstrates a fusible mixture. Mining machinery, consisting of boilers, air compressors, etc., has been installed upon the property and development work is actively engaged in. The shaft sunk on the Leizert vein is now at a depth of 80 ft. and preparations are being made to drift in various directions. The vein is shown up by cross-cuts and pits and can be followed for more than 1000 ft. As a self-fluxing copper ore the development is looked forward to with much interest. The Northern Ontario Copper Company, Ltd., owns the property and the head office is in Sault Ste. Marie, Ont. Mayor Gimby, of Sault Ste. Marie, is president.

The Stamp Mill and Cyanide Plant of the Combination Mines Company at Goldfield, Nevada.

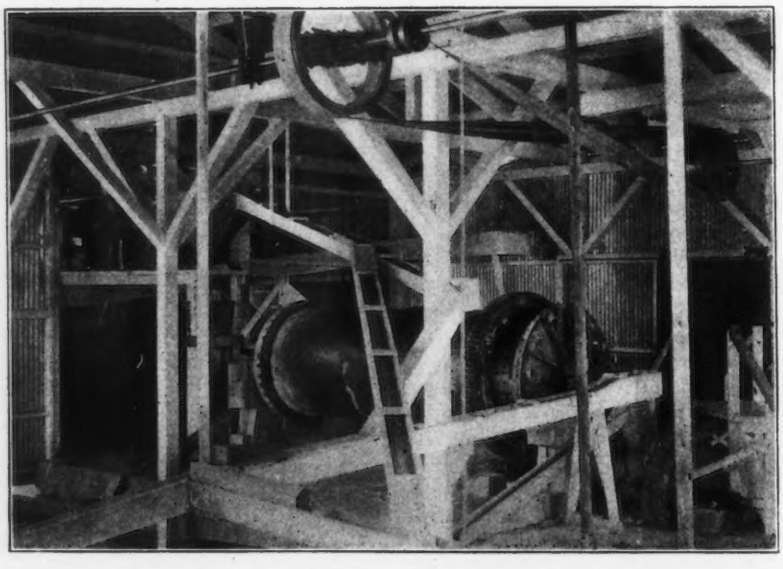
BY MARK R. LAMB.*

This successful little mill, as just completed, consists of 20 stamps, copper plates, two Bryan mills, one Wilfley table, seven Frue vanners, three Wilfley slimers, one Abbé 12-ft. tube mill, three Frenier sand pumps, a system of cone classifiers, eight filling tanks, eight leaching sand-tanks, together with slime settling, agitating and storage tanks and a Butters slimes filter box.

When the mill was first built it consisted of 10 stamps, two Huntingtons for fine grinding and the cyanide plant, with the exception of the filter box, in place of which was used a filter press. At that time the ore was all oxidized, as the mine had not attained any great depth. So long as the character of the ore remained unchanged, the plant was fairly successful. The ore treated is very high-grade, averaging about $124 per ton, and often being worth $300 per ton. Under these circumstances, it can be readily understood that the percentage of extraction must be high, in order that the tailings be not sent out too rich. As a matter of fact, the extraction of values continues after the sands are discharged, and enough cyanide is sent out with the tailings to have an appreciable effect on them. While I was superintendent of the mill, the solutions running from the tailings tested about 0.6 lb. cyanide per ton and assayed $1.60 per ton. When it is known that the sand tanks are emptied by water under pressure, requiring over 20,000 gal. to each tank, the values carried from the sands by this solution can be approximated.

The Huntington mills were of a new type and were given every opportunity to prove their worth. Repairs were continuously under way and the work of the mills when running was not what was expected. The Huntingtons were finally replaced by Bryan mills. The latter were supposed to run at 45 r.p.m., and were started at that speed. However, the die ring wore so unevenly during the first two weeks that the speed was reduced to 26 r.p.m. The manufacturers explained this by saying that it was due to the fineness of the material fed. Our stamps were then crushing through 12-mesh. The mills at the slower speed do the work very well, crushing the pulp from the batteries, which are now provided with 8-mesh screens, through slot screens equivalent to 45-mesh. As the extraction from the slimes is much better than from the sands the object should be to slime as much of the ore as is possible. As the slime plant is now arranged, the whole output of the mill could be handled by one man on each shift.

GENERAL VIEW OF PLANT.



TUBE MILL.

The mill as it is now expected to handle the output of the mine, is divided into two parts. Ten stamps crush oxidized ores, which are amalgamated, concentrated and cyanided. The basic ores are crushed by the other 10 stamps, amalgamated, concentrated on the Wilfley table before regrinding, and concentrated on Frue vanners after leaving the Bryan mill, the tailings being elevated to the tube mill by which the sands are reground to slimes (85 per cent. through 200-mesh). These slimes are concentrated over Wilfley slimers and are then sent to the classifiers for the separation of the small portion of sands which they contain. The sands, although from sulphide ores, are expected to leach as readily as the oxidized sands. The slimes are of course sent to the slimes storage tanks and treated with this product from the other 10 stamps.

The sands are treated with a strong solution of 4 lb. per ton for five days. Weak solution of about 2.5 lb. is then run on for 2 to 2.5 days, after which water displaces the solution until its strength is not above 0.5 lb. This program is varied sometimes owing to slimy tanks, which seem to be unavoidable. The same classifiers are now used with 20 stamps as were installed for 10, and are apparently overloaded.

Gold and silver are precipitated from the solutions in the usual zinc shavings boxes. A rather peculiar feature of this department is that the best preciptation is obtained in the waste solution boxes. The strong solutions as they come from the sands and slimes titrate about 3.2 lb. per ton and assay perhaps $20 per ton. The tailings from the zinc boxes assay about $4.50. On the other hand, the waste solution titrates 1.1 lb. and assays $2,

* Milling and Cyaniding Engineer, Goldfield, Nev.

say, and leaves the boxes worth about 6c. per ton.

The tube mill is lined with silex blocks, which are wearing rapidly owing to the extreme hardness of the ores. To give a proper idea of the toughness of the ore it may be stated that the stamps weigh 1400 lb. when newly shod, drop 100 times per minute and only succeed in crushing four tons per stamp through 8-mesh in an average day of 22 hours. This short day should be explained, inasmuch as it is not due to fault of machinery so much as it is to lack of sufficient grade. At the foot of the battery-plates are cone classifiers, which separate the slimes from the sands (sent to the Bryan mills) and the grade is just sufficient from these cones to the Bryan to encourage one to expect the sand to travel. It does travel part of the time. Below the Bryans are silver traps which have not enough fall, and the launders to the vanners from these traps are periodically overflowing. The tailings from the vanners are elevated by a spiral sand pump to the level of the cones, and as each 10 stamps is provided with a pump, repairs to the latter means interrupted crushing. The product from the second 10 stamps is elevated three times, once from the Wilfley to the Bryan, again from the Frues to the tube mill and a third time from the slimers to the cones. This system of elevators is a prolific source of trouble.

UNEVENLY WORN DIE RINGS.

The battery is the first of its type erected. It was designed by M. P. Boss and possesses many good features. The low mortar, heavy boss, *broad* concrete mortar foundation and 7-in. cam shafts are the features which appeal to a millman. Since the mill was erected there have been no breakages of stems or cam shafts.

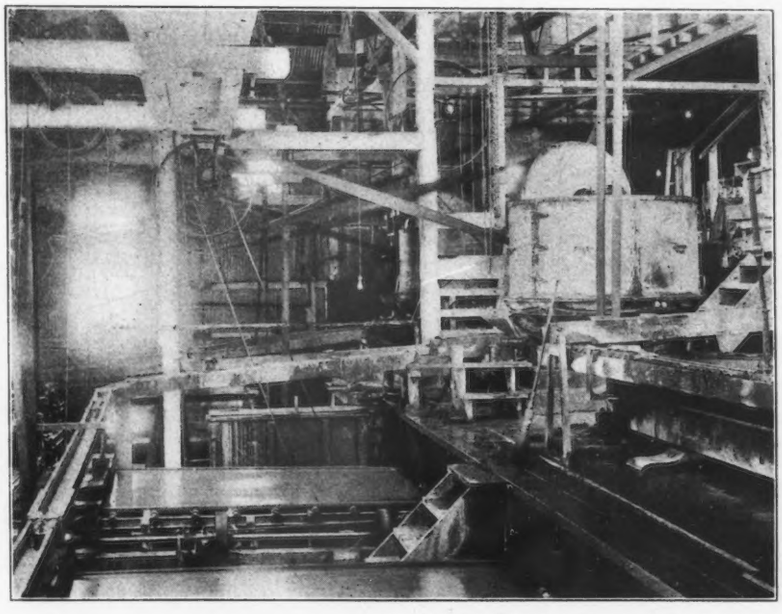
The plant as a whole is very satisfactory to the owners and is handling a grade of ore which it would not pay to ship, and at a cost, during May, of about $5 per ton. This will be reduced as freight rates are made lower, and I have no reason to doubt that the cost per ton will be reduced to $4 before the end of the year. The Butters slimes plant has largely increased the extraction, decreased the loss of solution and the labor required to filter-press the slimes in the ordinary way. Briefly, it is a series of canvas cells hung vertically in a square, pointed box, connected together and to the suction of a vacuum pump. After agitation with solution, slimes are pumped into this box and the vacuum forms a cake (in this instance, ¾ in. thick) on the cells. When the cake is formed the remaining pulp is returned to the storage tank, wash solution is pumped into the filter box and in its turn, drawn through the cake by the vacuum pump. After washing 20 minutes, this solution is returned to its storage tank and the filter box is filled with wash water. A wash of 15 minutes suffices to extract completely all values in solution.

Following are a series of assays which give an idea of the thoroughness with which the slime cake is washed. It should be stated that the "water" wash is, in reality, solution which would otherwise be waste solution, and which assays 40 to 60c. per ton. This water as it is drawn through the slime cake, does not go to the zinc boxes, but is used to replace the "weak wash" which is sent to be precipitated. The weak wash assays $4.02 per ton:

Weak solution wash of slime cake, after washing 2 min., $12.22; 4 min., $12.20; 6 min., $11.89; 8 min., $11.96; 10 min., $11.40; 12 min., $10.90; 14 min., $8.90; 16 min., $6.82; 18 min., $4.76; 20 min., $4.46; 22 min., $4.26; 24 min., $4.12; 26 min, $4.10; 28 min., $4.02.

The following is a series of assays of the water wash as discharged from the vacuum pump taken at intervals of five minutes: 5 min., $3.66; 10 min., $3.62; 15 min., $3.12; 20 min., $0.60; 25 min., $0.60; 30 min., $0.60.

After the slimes are washed, the vacuum pump is disconnected and water under slight pressure is turned into the cells, thus forcing the layer of slime loose. This latter falls into the pointed bottom of the box. Surplus water is drawn off and the slimes discharged from the box by means of a quick-opening gate valve. About five tons of water is required to discharge five tons of slime in this plant. An increase in capacity of this plant would merely require the substitution of a larger pump, as the time consumed in transferring pulp and solution and wash is lost.



INTERIOR OF MILL.

One man per shift could as easily, in a larger plant, treat 400 tons per day as 40 per day, as he has merely to open and close valves. Slimes tails at present assay 60c. from ore worth $70 per ton.

As the sands tails assay about $2 higher, it seems probable that it would pay to slime the entire product. Figures as to the cost of sliming by the tube mill are not yet obtainable, but will no doubt be published by Mr. Bosqui, who designed the mill and who is metallurgical engineer for the Combination Mines Company.

Transvaal Mining Notes.

SPECIAL CORRESPONDENCE.

The poster about which there has been so much excitement has been placed in all the Chinese compounds of the Rand. The mines fought to the last, taking the case to the supreme court in Pretoria. They maintained that the offer of repatriation under certain conditions, was illegal, since it interfered with a properly drawn contract between the coolies and the mines. The Supreme Court gave the decision that the posting of the notices in the compounds was quite legal. The notices, therefore, had to go up. The mining authorities refused to post them, so the officials of the Foreign Labor Department went to the compounds and put up the notices. It was feared that at some mines where the feeling ran high, the notices would be pulled down, but no trouble was experienced.

Everyone eagerly watched to see how the coolies would take the offer of repatriation, There was a feeling of relief when it was found that they read the notice with indifference. It is now safe to state that scarcely any of the coolies will take advantage of the proposals of the Imperial Government. They declare that they will finish their contract before going back to China.

Tin Production in China.

China has long been known to be a considerable producer of tin for domestic consumption, but there has been little or no precise information as to the amount. Some light is thrown on this subject in a recent report of W. H. Wilkinson, British Consul-General at Yunnanfu, on the production and sale of tin at the Kuo-chia mines (near Mengtzu). He states that the methods of 30 years ago are still in force. The market value of tin at Mengtzu before paying export duty is $60 (£6) a picul (133⅓ lb.). All tin passing Mengtzu goes to Hong Kong, whence it is distributed to Canton, Swatow, Ningpo, Shanghai, etc. The amount thus exported in 1904 was 50,043 piculs, and its value 3,187,214 taels (£478,082), The whole trade is in Chinese hands.

The Remington Salt Company.

BY CHARLES S. PALMER.

The works of this company are situated at Ithaca, on the southeast end of Lake Cayuga. The plant is located directly beside, and is mechanically a part of, the electric light-and-power plant which supplies the city of Ithaca; and it is largely due to the mutual co-operation in steam making, using exhaust steam, etc., that the salt company is able to manufacture salt in the cheap way herein described.

The salt beds from which the supply is obtained are two in number, each about 40 ft. thick, separated from each other by a layer of slate 8 ft. thick, and lying about 2000 ft. in depth below the level of Lake Cayuga. The borings (which were driven with frames much resembling the common oil derricks) carry a double-walled casing. In the outer jacket of this casing (which is 8 or 10 in. in diameter), water is forced down under pressure to the top of the upper salt bed. The inner tube of the casing (which is 3½ in. in diameter), extends to near the bottom of the lower salt stratum. Thus the salt is dissolved by the water from the outer jacket, and a saturated solution is formed; this is forced up the center tube from the bottom of the deposit. The water (taken from Lake Cayuga) falls to the top of the salt bed, accumulates a large subterranean lake of strong brine, and gradually sinks to be raised as stated. This brine has a sp.gr. of 1.3, and consists of one-third salt and two-thirds water. The hydrostatic pressure of the water column in the outer jacket is equal only to about two-thirds of the pressure in the inner cylinder of the casing; so that the brine practically has to be raised through the difference (700 ft.) by extra pressure carried by the water forced down through the outer casing; for the salt deposit is in a closed cavity.

The strong brine when raised to the surface is led directly to large settling and storage tanks high on the hillside. Here the brine is clarified by the addition of a little lime which precipitates some impurity as insoluble sediment. These brine tanks are also supplied with steam coils (supplied with exhaust steam from the power house as described) which heats the brine to about 90 deg. F. before it is concentrated in the mill proper.

In the mill. the brine flows by gravity from the storage tanks to simple 30-ton vacuum pans; these contain in the lower part 1700 (4-ft.x2-in.) pipes carrying exhaust steam. The vacuum is maintained by pumps actuated by live steam.

The clarified and warmed brine is fed in at the top of the vacuum pan in a constant stream, is concentrated, and sinks to the bottom of the pan as a thick mush of fine crystals. This salt mush is raised by a bucket elevator, to the top of the mill where it is dried in centrifugals (1200 lb. of salt at a charge). It is then dropped into hoppers which convey it to a "kiln drier," a rotating iron cylinder supplied with steam coils and a current of dry air. After this the salt is passed through a 20-mesh screen, the coarse part being a very small fraction. The salt is prepared in quality of table fineness, most of which will pass a 40-mesh opening. It is quoted at $3 or $4 per short ton, plus the cost of packing in bag or barrel. The waste residue from the centrifugals is thrown into the lake as it carries no valuable bittern (bromide or iodide) and is not suitable for being used over again.

The plant is provided not only with the vacuum-pan equipment, but also with shallow open-evaporation tanks of wood carrying 6- or 8-in. steam pipes (the Michigan system). In this open-tank system, the size of the crystal grain can be controlled; and various grades are made depending on the size of the grain; but in the centrifugals the size of the grain cannot be controlled, and it often varies considerably, without warning, and under apparently the same circumstances. In general, the finer-grained grades are made in the pans.

The effect of the climate on manufacture is shown in the statement of the superintendent that in summer the efficiency of the plant is 12 per cent. better than in winter. Regarding the vacuum-pan practice, the management is very skeptical regarding the practical value of the "double" or "triple effect" as applied to the evaporation of salt brine. At the same time, the apparatus is in use at other works, and reports are forthcoming regarding its utility.

The daily production of the Remington plant is from 90 to 100 tons; the actual capacity is perhaps fully twice this.

Experiments with a Campbell Fan.

Engineering (London, May 18, 1906, p. 663) publishes the discussion, before the Paris Acadamie of Sciences, by Henri and Leon Bochet, of the results of an elaborate series of experiments made on a Campbell fan. The net efficiency they found to be about 60 per cent. as a maximum, but it also appeared that if the kinetic energy of the air at certain points of its path were measured, the apparent efficiency exceeded unity, and might reach nearly 1.67. The explanation is, of course, to be found in the laws governing the flow of a fluid through a channel of varying section. If water flows through a converging-diverging nozzle, its velocity head at the throat may be much greater than the total nominal head-producing flow. Incidentally they noted that the coefficient of contraction for a jet of air flowing through an orifice in a thin wall was not independent of the size of the openings, being about 0.80 when the area of these is about 15.5 sq.in., diminishing to about 0.40 for extremely small openings.

Coal Mining by Open Stripping in Pennsylvania.

BY F. W. PARSONS.

There are few places in America where the coal seams lie so close to the surface that they can be exposed and profitably worked after stripping off the cover of dirt and rock. This method of mining is carried on in some parts of the Hazelton district, much in the same way that was employed 15 years ago.

These coal deposits were first worked in a method similar to the general system used throughout the field, and as a result, much trouble was experienced in attempting to support the roof and at the same time extract a reasonable percentage of the coal. Many accidents occurred, and much timber was used, but the best result that could be obtained by this system was to win about 45 per cent. of the coal. It did not seem advisable to leave the remaining 55 per cent. unmined, so a contract was let to strip off all the surface at a price per cubic yard.

In this stripping work, which was thus started, the method of operating was to break and loosen the surface, and by means of steam-shovels, to raise the dirt and rock into cars, which were hauled by mules some distance to a fill, or point of dumping.

The seam as here worked, varies from 25 to 40 ft. in thickness, and is of uniformly good quality. The composition of this coal has been an interesting study to scientific men, who have visited the field. It is a generally accepted theory that in the formation of coal deposits, and especially anthracite, pressure from above has played a very important part in determining the hardness and quality of the coal. That this seam should be anthracite of a fairly good quality, and still have only 40 to 80 ft. of sandstone and dirt as a cover, seems at first surprising; but when we consider that this whole valley was at one time traversed by a gigantic glacier, it is easy to believe that the present surface lines may have little in common with the topography as it originally stood.

The strata enclosing these coal measures are of a pitching nature, and in no place remain level for any considerable distance. In Fig. 1, which shows a general view of the largest pit near Hazelton, there is an anticlinal traversing this section, passing through the middle of the pit in a northerly and southerly direction, or from left to right on the figure. At the apex of this anticlinal, the coal is thinnest, conforming to the general condition, that in a variable or pitching seam the coal is squeezed into the swamps and is there thicker than on the adjacent rolls.

The coal dips away from this anticlinal in a westerly direction, or toward the shaft of the mine proper. Fig. 2 shows this No. 7, or Mammoth vein, as it is called, going under cover. At this same point, the coal mined in the open workings is dumped into a chute leading to a hopper bin below; this bin is kept nearly full so the coal can be fed into cars with as little drop, and consequent breakage, as possible. The cars which receive this coal are hauled about 3000 ft. underground, and then hoisted to the breaker.

The average pitch of the Mammoth vein is about 30 deg., although in some parts of this field, the coal seams turn completely over, or fold on themselves. The fact that the coal in the mine is of a firmer character and not so friable as the coal in the open workings, is due principally to the fact that this latter coal is considerably injured by being exposed to

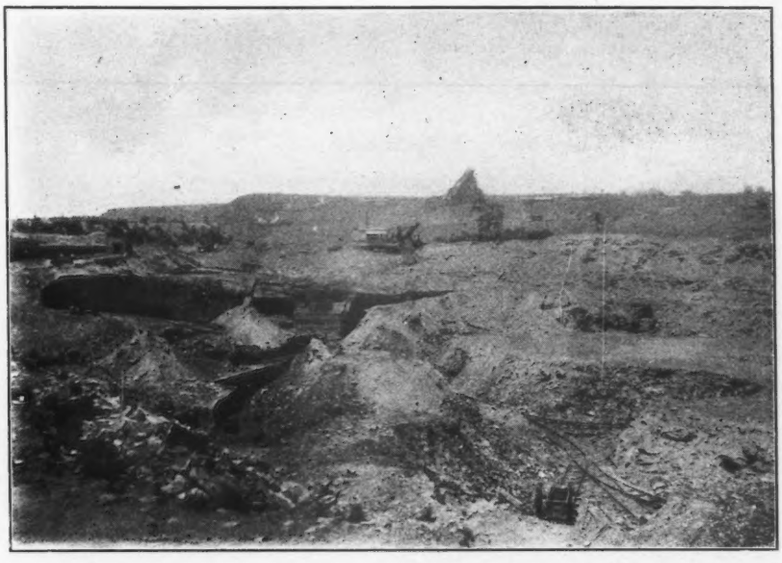


FIG. 1.

FIG. 2.

the weathering action of air and rain. On the east side of the anticlinal is the No. 6 seam, which is, however, a continuation of the Mammoth, but pitching in the opposite direction. These two seams vary from 20 to 40 ft. in thickness. In Fig. 3, the No. 6 is shown exposed; it measures 26 ft. thick at this point.

The present method of working this seam is to start at the top, and remove a layer 8 to 10 ft. thick, then to sink down 10 ft. more and remove another layer; and so continue until the entire seam is removed. In doing this, a main haulway is driven, and branches from this road are turned off every 30 or 40 ft. In Fig. 4 is shown one of these branch faces, where the miners have just loaded a car. At each face, one miner and three laborers are employed, and these four men in nine hours, mine, load, and push 15 cars of coal to the dump shown in Fig. 1. The miner is paid $1.94, while each laborer receives $1.29 for the nine hours' work. This means that after the stripping is done, 45 tons of coal placed in the hopper bin ready to be hauled to the breaker, costs $5.81, or 13c. per ton. One hundred cars are drawn from these workings in nine hours when a large output is desired, although that amount is not attempted every day. To this cost of 13c. per ton, 1c. must be added to pay wages of pit-foreman, and about 6c. to pay incidental expenses in the pit and haulage to the breaker, making each ton of coal cost 20c. per ton delivered in the breaker. This seems a very low estimate, but when the cost of stripping and treating in the breaker is added, the average cost is considerably increased.

The entire city of Hazelton is underlaid by the Mammoth seam, while 150 ft. lower down is the Wharton seam, and 50 ft. below that, the Buck Mountain. The location of Hazelton is rather unfortunate, because the time must come when this coal underlying the town will be mined. The Lehigh Valley Coal Company has already purchased some of the houses near the strippings, and the work will be extended further back.

Mr. Cuyle, who is superintendent of the stripping work, has moved over 3,500,000 tons of surface in the last 12 years. The steam shovels used in this work are built entirely by Mr. Cuyle, who has several patents for improvements used on them. Each of these shovels is fitted with a dipper holding 2 cu.yd., and will handle 1000 cu.yd. a day in good digging. Each shovel employs 30 men, one blacksmith, and three or four drivers.

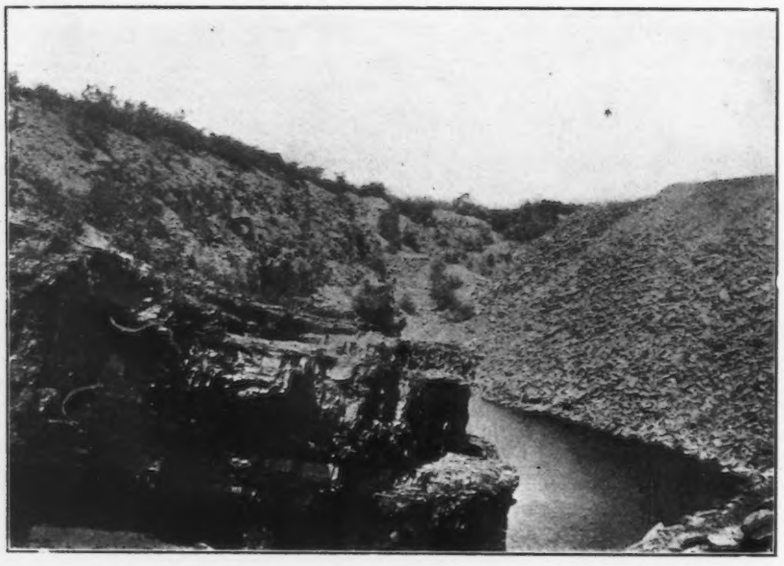


FIG. 3.

FIG. 4.

The method now in use for mining this immense seam of coal seems rather primitive when we consider the many excellent mechanical devices now in use. An aërial tramway of the continuous-bucket type, operating between a central terminal bin, and the mine breaker, could certainly be arranged to deliver coal cheaper and with as little breakage as the system now in use. Such a tramway after clearing a large area, could be swung to right or left and used in mining a new area. Another system seemingly adaptable for mining a thick seam of this kind, with a roof and cover similar to the one here encountered, is the "caving" method used in the iron mines of Michigan. This would consist in driving two narrow entries, heavily timbered, along the bottom of the seam to the limits of a certain area or section; then at the middle of this section and along the line of the entries, drive a raise to within 8 ft. of the roof and here drive a system of narrow entries and cross entries to the limits of the proposed area, and then work everything back to the raises or chutes, allowing the roof and cover to follow this retreating work. Along the roof of the first slice taken off, a system of forepoling or timbering is used, so as to prevent the dirt and rock, as it comes down on succeeding levels, from mixing with the coal. This method gets not less than 95 per cent. of the iron ore, and by introducing some necessary modifications, a like quantity of clean unbroken coal could be obtained. Where this system is used, it is necessary that the surface be owned by the mining company.

The companies operating these strippings must find the present system profitable, or it would have been abandoned years ago. However, the deposits of coal near the surface, that are still to be worked in this district, are so extensive, that a reasonable method for working the seams, even though experimental at first, would be justified by the possibility of increased economy, and consequently larger earnings.

Recent Developments in Electric Mine Haulage.

Since 1887 when Schleisinger's aptly named "Pioneer" was built for the Pennsylvania Railroad, there has been a great advance in the design of small mining locomotives. While electric locomotives of various designs have been extensively used for the principal haulage work, it has been the general practice to gather the cars from the breasts and chambers of the mine by mules or horses. It is along this line that several new electric locomotives have been developed known as the gathering locomotives.

The cost of maintenance for mules and drivers varies with the accuracy of the bookkeeping, but may be placed at from $2.50 to $3.50 per day. Since the economy of general electric haulage in mines has become so apparent, there has arisen a need for an electric locomotive to meet the special requirements of the smaller traction work in rooms. It is practicable to place a trolley wire along the room roads, and both the storage battery and compressed-air locomotive have failed to fulfil the conditions; the first mentioned being ill adapted for rough mine usage, and the second inefficient and restricted in range of action. Several arrangements of electric locomotives have been designed and work admirably under this service.

An example of such an arrangement on an electric locomotive is shown in Fig. 1. This machine was built by the General Electric Company and consists of a standard General Electric mining-type locomotive, weighing from five to seven tons, provided with a reel carrying about 600 ft. of flexible insulated cable. On the main and butt entries of the mine the locomotive operates from the overhead trolley wire in the usual manner, but when entering a room, or chamber in hard-coal terminology, the trolley pole is lowered and the end of the cable is attached to the trolley wire. The locomotive then proceeds toward the face of the chamber (with the empty car), paying out the cable through which the current is supplied to the motors. On picking up its load, the cable is automatically rewound on the reel which is now positively driven from the locomotive axle by a sprocket chain. Iron rails are generally used for room haulage today, but should wooden rails be in place, it is simply necessary to provide the locomotive with a double-conductor cable instead of using the ordinary single conductor with rail return.

One of the most surprising features in regard to the operation of this cable-reel device is the long life of the cable. It might be expected that it would become rapidly abraded, but such is not the case, as the cable is carefully laid on the floor under moderate tension, and as carefully rewound. Owing to this improved reel-winding mechanism, a flexible and well insulated cable may be expected to last a year in regular service before renewal is necessary.

Where heavy cars are used and severe grades prevail, the economy of this locomotive is greater than in more ordinary conditions. In other words the more severe the service, the more favorable is the showing made by such a machine. Small cars are, however, generally employed in working low veins, and here the gathering locomotive has an advantage, in that it is unnecessary to "brush" the roof or take up the floor to make headroom, as is the case when mule haulage is used. In the anthracite district where the haulage conditions are particularly severe, these locomotives are regularly doing the work of 10 to 15 mules. A seven-ton locomotive of this type has hauled loaded cars out of a dipping chamber where the grade was so steep that four mules in tandem were required to drag a single car. With the less severe conditions in the bituminous-coal fields, experience has shown that a five-ton electric gathering locomotive may be expected to displace from five to seven mules. The success and economy of this method of haulage is therefore seen to be a practical certainty.

Another illustration of progress in electric coal haulage is the tandem locomotive. For the transportation of a heavy tonnage in mines where the headings are of considerable length, there is need for a heavier locomotive, weighing from 20 to 25 tons. With 50 or 60-lb. rails maintained in good condition, a 20 ton four-wheel locomotive is entirely practicable and has the important advantage of simplicity. Where the rails are light, however, and it is necessary to distribute the weight over a longer wheel-base, a different design is essential. Six-wheel locomotives weighing 20 tons have been built, but because of the long rigid wheel base and practical operating difficulties, they are open to serious objections. The tandem locomotive on the other hand, has a short rigid base in each unit and can, therefore successfully negotiate sharp curves. The weight is perfectly distributed on the four pairs of driving wheels and there is no tendency to overload any of the motors. As a consequence the wear and tear on the track will be less. In addition to this, either of its units may, in emergency, be operated singly. The locomotive shown in Fig. 2 consists of two-ton locomotives coupled mechanically and electrically. One of the machines is equipped with a four-motor controller, in the reversing cylinder of which is incorporated a commutating switch so that the locomotive may be operated in either direction with the four motors in parallel or in series-parallel.

This method of control effects a consi-

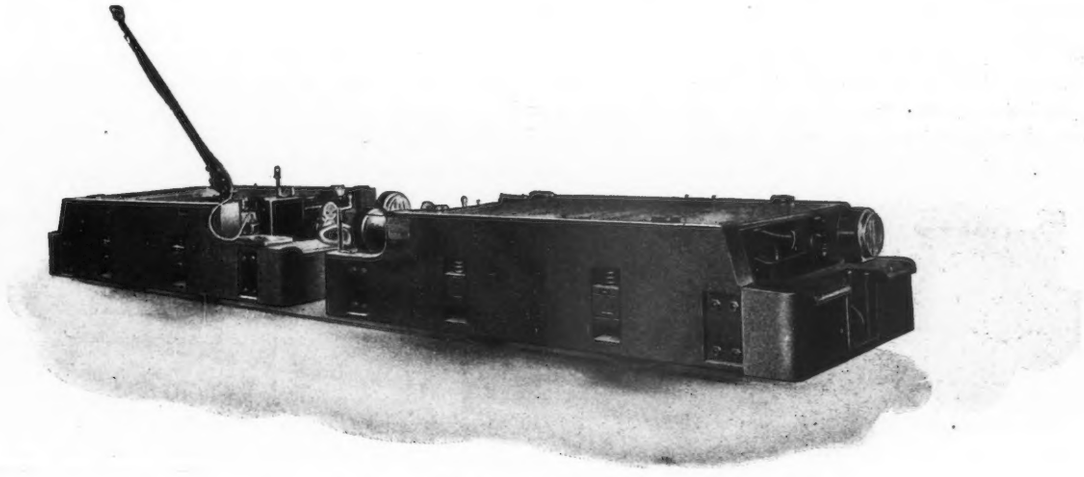


FIG. 2. TWO-TON LOCOMOTIVES.

derable economy in the current consumption, since with the four motors in series-parallel, the locomotive will develop a given draw-bar pull with half the current that is required with the motors all in parallel. The brake mechanism on this locomotive is arranged so as to apply the brakes simultaneously on each of the eight drivers. In a coal mine with a large output, these locomotives are advantageously employed to haul coal from side tracks where the cars have been previously assembled by gathering locomotives.

Turning now to the method of distributing the current, recently a three-wire system has been applied to mine haulage. In the anthracite field, 275 volts is the customary potential for electric haulage, but the low voltage often involves high line losses, especially in view of the fact that the electric hoists on the slopes are operated from the same circuit. Many such hoists require 150 h.p. or more, and are often located at considerable distance from the power source so that a prohibitive investment in feeder copper would be required to secure a low line drop in a two-wire line. This problem has been satisfactorily solved by the D. L. & W. R. R. Company by adopting the three-wire system in the manner shown in Fig. 3. Two 275-volt General Electric generators are operated in series with the neutral acting as the track return. The 250-volt electric mining locomotives are operated on each side of the three-wire system, while the hoist motors are operated across the 550-volt circuit as shown. This system of distribution while permitting the use of 250 volts for locomotive operation, secures also the advantages of 550-volt transmission for the hoists.

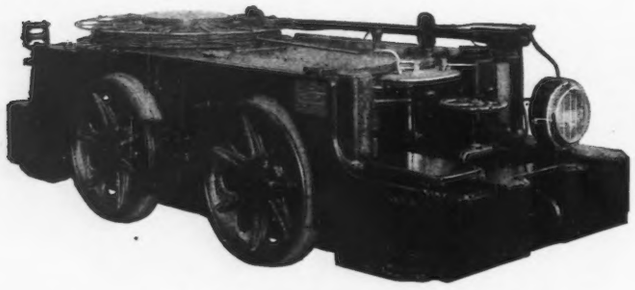


FIG. 1. GATHERING LOCOMOTIVE.

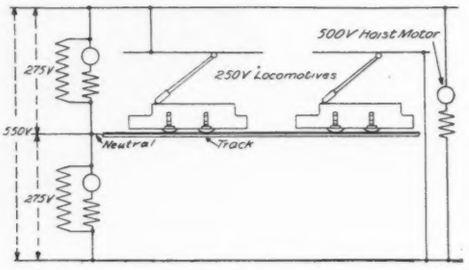


FIG. 3.

The Explosion Hazard of Electrical Appliances in Collieries.

Recent experiments at the Gelsenkirchen testing station in Germany to ascertain the most suitable devices for preventing the ignition of firedamp by sparking in electrical appliances, extended over a period of three years, and have been reprinted in a pamphlet of 89 pages, with numerous illustrations.

The results indicate that the hermetical casing, wire gauze protectors, and oil-bath casings are best, each being best suited for certain particular conditions. The hermetical casing is not suitable for appliances that are likely to get hot while in use; in such a case ventilation would be necessary. This form of device is also heavy (having to be built very strong), but has the advantage of being able to withstand considerable external shock.

The wire gauze casings are easily ventilated, and are both cheap and light, but are not very strong. The gauze should be of the normal dimensions used in safety lamps, viz., 1/75-in. wire, and 940 meshes to the square inch. Bronze or galvanized steel wire is the best material, and should be as carefully cleaned and kept free from defects as the ordinary safety lamp gauze. No soldering is permissible on the gauze, and the latter must be tightly screwed into rigid frames and also be protected from external injury by perforated sheet metal, fastened over it.

The oil-bath casing affords the best protection of all, since it entirely prevents access of firedamp to the parts where ignition could arise. The casing should always be filled with sufficient oil to cover all sparking parts. The point showing the necessary depth of oil, should be marked on the casing, and the actual level of the oil at any time should be visible without opening the casing. Where a transmission of current occurs beneath the surface of the oil, the contacts should be so constituted that no extensive decomposition, or gasification, of the oil will occur beneath the surface. The shape of the casing should preclude any exposure of the sparking parts by violent motion of the oil.

Besides the features above indicated in the different styles of casing, it is advisable to adopt other protective measures, such as locking devices, etc.

As regards the best form of casing to use for different appliances, it is found that for motors of low capacity, such as those used for rock-drills and coal-cutters, the hermetical casing is most suitable. For motors of larger size, used for driving fans, air-compressors, pumps, winches, etc., the wire gauze is preferable. For switches and safety plugs, the hermetical and oil-bath casings are best, because no ventilation is needed; in fact, all starting resistances and transformers may generally be immersed in oil.

The precautions here outlined, will greatly reduce the danger resulting from the sparking of electrical appliances in fiery mines, and make possible the adoption of electric power in collieries where its use is now dangerous.

The Yampa Coal Field, Colorado.

The United States Geological Survey is about to publish a preliminary report by N. M. Fenneman and H. S. Gale on the Yampa coal field of Routt county, Colo.

The Yampa coal field has been known for a great many years, it has been practically inaccessible, and but very little has been done toward its development. It is, however, the intention of the Denver, Northwestern and Pacific Railroad, to extend its present line from Middle Park through Gore cañon and thence across to the Yampa valley. When this is done the Yampa coal field will become one of the important sources of coal supply in Colorado.

The field, which covers practically 1200 miles, centers about Hayden.

The coals of this field are for the most part bituminous, although anthracite of excellent quality is known to occur within a certain limited area.

Three groups of coal seams are known. Each group has a vertical thickness of from 200 to 400 ft. and the several groups are separated by 500 to 1000 ft. of barren shale and sandstone. The number and thickness of the coal beds constituting each group vary from place to place, but usually there are at least three seams of workable thickness and a number of smaller beds in each group. The largest bed of coal reported from the field has a thickness of about 20 ft.

The anthracite field lies north of Yampa river, and the character of the coal is due to igneous intrusions. At the present time this part of the field is attracting more attention than any other, but, although containing some coal of a higher grade, it is of a limited geographic extent, and probably will not be so valuable as many have supposed.

Colliery Notes.

Experiment shows that the dust found at the coal face of any room, or entry, is not nearly as dangerous as the dry fine dust found on the main haulage roads.

In picking a good quality of anthracite coal, many purchasers select that which appears smooth and glossy, although the knotty curly coal is much better. The smooth coal splinters and cracks when put on a hot fire.

The following rule is a good method for determining the safe working load of a chain: D = diameter of iron in eighths of an inch; $D^2 \times 0.111$ = safe load in tons. This gives for a ¾-in. chain a working load of $6 \times 6 \times 0.111 = 3.996$ tons.

In making chain from bar iron the loss in tensile strength due to welding and the bending action due to curvature is about equal to 25 per cent. of the original iron. On this basis, the size of the iron bars for making a chain of specified strength can be determined.

Engines for driving power dynamos should have trip expansion gear, to get the best results. It is a mistake to control an engine, subject to a varying load, by the use of governors at the throttle valve, thus reducing the initial steam pressure in the cylinder, causing wire drawing and a high steam consumption when working with a light load.

At a colliery having a central condenser, and where the condensed steam water can be used over again, the water-tube boiler is the most efficient for the generation of steam for the electric power house, but is not suitable for winding engines. If the boiler feed water is hard, the water from the condenser should be filtered, and the water required to make up any loss, softened, in order to prevent the formation of scale in the boilers.

While breaking rock in the Conyngham shaft, Richard Thomas, a miner, discovered the fossil of a large fish. In shape it resembles a catfish. It is 4 ft. long and 1 ft. wide, and 5 in. thick at the largestt part of the body. One side of the head is intact but the other side was broken while being taken from the rock. It was found in the Baltimore vein, 809 ft. below the surface. This shaft is in the Wyoming district of the anthracite fields.

In securing a thoroughly reliable chain for use at collieries, the short-link crane chain is probably best. The iron used must not be inferior, and merits first consideration. The iron bars should be truly circular, free from longitudinal grooves caused by badly set rolls, free from laminations or parts not properly welded, with sufficient cut off the ends of the bars to secure homogeneous metal. When the iron is nicked and broken it should show a fibrous and silky texture.

Timber required for use underground, or, in fact, anywhere, should be felled during the winter when it has but little sap in it, because the sap in wood ferments and produces rapid decay. It should also be well seasoned and the bark removed if the best results are to be obtained. In selecting a preservation such as creosote, tar, etc., it should be remembered that many of these preparations have the disadvantage of making the wood easily ignitable.

The question of making a wire rope that will be non-rotating is occupying the attention of many manufacturers. There are several ropes now on the market, said to be non-twisting, when hoisting or lowering a load. The lock-coil rope is chief among these, but it does not seem possible to make this type of rope flexible enough, nor is it made in as long lengths as other ropes, a coupling being necessary. It is generally considered essential that a rope to be non-rotating should have a wire-main core.

In working iron bars up into a chain, it is easy to see that the longer each individual link, the less will be the number of welds, and the cheaper the resulting chain in first cost. It is sometimes claimed that each weld is a source of weakness, and that the chain containing the least number will be the stronger. This is not true, for the longer the link, the greater will become the knuckling action at the ends when going over sheaves and pul leys, and the larger the sheaves must be if the chain is to work upon them without undue wear.

Many of the accidents which have recently happened in mines of this country are directly traceable to a violation of some law already supposed to be in force. One of the commonest violations of this character occurs when miners are permitted to take kegs of powder, holding from 15 to 30 lb., into the mine. This is a deliberate violation of the laws of most States. Competent authorities recommend that under no circumstances should powder be taken into the mines in cans of a capacity exceeding 5 lb. The lives of five men were lost about one year ago in a mine in West Virginia, by a miner taking 24-lb. kegs of powder into the mine, and then attempting to open them with a pick.

Much interest has recently been shown in regard to electric winding, and a number of electric hoists have been erected in various parts of this country and Europe. One plant is raising 2000 tons in eight hours from a depth of 918 ft., at a speed of 33 ft. per second. Later on, the depth is to extend to 1635 ft. below the surface, when the speed will be increased to 66 ft. per second. At this colliery, the drum is 19½ ft. in diam., and a 1¾-in. rope is used. The deepest shaft that has lately been equipped with an electric hoist, is at Pelkum, Germany, where 1400 tons are raised a distance of 2460 ft. in eight hours. The depth of this shaft is to be increased later on to 3000 ft; the speed employed is 59 ft. per sec., and the useful load per wind is 5.2 tons.

The installation of a fan at a mine is no assurance that the workings are properly ventilated. The most important thing in this connnection is to see that the volume of air sent into the mine is well distributed to the faces of the entries and rooms. This cannot be effected if improperly constructed mine doors and stoppings are allowed to exist. This neglect on the part of the mine officials is frequently the source of much trouble, and combined with the mistake of having the doors stand open, due to improper attention, causes a cutting off of the air-supply from the working places. Considering the magnitude of present mining operations, the State legislatures would be justified in enacting a law whereby automatic self-closing doors would be required in all cases where such arrangements are needed.

A recent provision, which it was advocated should be made into a law, was that a supply of white mice should be kept at all collieries. It is well known that these animals are susceptible to poisioning by CO, their susceptibility being so great that they can be employed as a reliable test for dangerous quantities of the gas. The respirating exchange in a mouse is twenty times as rapid as in a man, and consequently the mouse more quickly exhibits symptoms of blood saturation, It has been scientifically proved that with 0.4 per cent. CO in the air, a mouse gave symptoms of illness—staggering gait—in one and a half minutes, and that it became unconscious in three minutes, whereas the investigator himself did not feel discomfort for half an hour. This gives a sufficient interval to allow a miner to escape. It is further claimed that air must be regarded as dangerous the moment the test mouse becomes incapable of motion.

Much discussion concerning the character and use of the different explosives in coal mining, has recently been entered into. Many of the English operators have proceeded to condemn bobbinite as dangerous because of its showing a flame when fired in the open and unstemmed. It should be remembered in this connection, that although with the higher explosives flame is not seen, nevertheless it may be observed that ignitions and explosions have resulted from their use, which go to prove that although not visible, both flame and heat are developed by all of these detonating explosives. Furthermore, it is true that no shots should be fired at the face of any working place containing even a small percentage of gas, and the fact that much danger is now being attached to the detonation vibrations, caused by the use of high explosives, forces the belief that bobbinite, being non-detonating, when properly handled, is safer than the high explosives so much discussed.

Metallics.

The discovery of petroleum at Pitomaca in Croatia, Austria, is reported.

The production of the Vieille Montagne company in 1905 was 92,759 tons of spelter, 67,258 of sheet zinc, and 11,007 of zinc white.

Slaked lime, whether dry or containing an excess of water, if sealed up from the air remains for an indefinite period without change. Hydrated lime possesses no inherent power of solidification. The discovery of old lime mortar, which had been buried for five hundred years, has been reported, and the mortar was said to retain its original softness.

When lime is slaked, 56 parts of it combine with 18 parts of water to form 74 parts of calcium hydroxide. Great heat is evolved in this process, and the action is expedited by the use of hot water. Certain poor limes, that is those that do not slake readily with cold water, will readily pass into the hydroxide form if boiling water is employed.

Owing to the smaller number of joints in the water space, the horizontal return tubular boiler is, so far as leakage is concerned, more efficient than the water tube type. The danger of large boilers of the h.r.t. type is, however, with high-pressure steam, so great that it offsets the possible advantage. Increased difficulty of construction also has much to do with this.

A correct mixture of gas or gasolene and air burns readily, but a weaker or richer mixture burns more slowly. In the gas engine the time of ignition is dependent to some extent on the mixture, and if the quality of the latter is varied the result is often pounding in the engine. This is especially true if the rate of burning is increased by the change in the mixture.

The ordinary gas engine is not reversible; if the explosive impulse comes too early it fires against itself and causes loss of power and pounding. The time of ignition is of importance in stationary engines, although in marine and automoblie engines it is often used to increase or decrease the speed. Too early ignition is apt in the end to cause breaking of the crankshaft and other damage to the engine.

Bisbee camp is an expensive one; timber, coke, labor and supplies are all high; while room is restricted to such an extent as to make all handling costly, and, until recently, metallurgical results rather poor. The nature of the ground seems to compel square-set mining, at least for the present; the earlier adoption of other and more economical methods would have necessarily resulted in an enormous waste of ore.

Malleability is the property of extending permanently in all directions, without rupture. As a rule, crystallized metals are not malleable and any circumstance that tends to produce crystallization will reduce malleability. Malleability lost by crystallization during mechanical treatment can be recovered by annealing, which consists in raising the metal to a high temperature, and allowing it to cool, generally at a slow rate.

Some metals are malleable at red heat, but not when cold; these are defined as being "cold short." Others are malleable when cold, but not when at red heat; these are described as being "red short." Some metals are malleable at all temperatures, others are not malleable at all. Zinc is brittle when cold and when hot, but at a temperature of 150 deg. C., it is malleable. The malleability of a metal is largely dependent on its purity.

The cupellation process for the separation of lead from silver and gold has been known from the remotest antiquity. The early Jewish writers allude to it as old and well known. The Greeks knew and practiced this method, as is shown by the discovery of pure gold and silver on the site of ancient Troy. The Arabians also knew of it, and it was the easy oxidation of lead that led up to the wild and visionary schemes of the alchemist.

Whenever two metals in contact are heated, an electrical current is generated whose intensity is a function of the temperature. In a circuit composed of a number of metals the resulting current is equal to the algebraic sum of the various component currents. The e.m.f. of a couple is not altered when one or several metals are inserted between its two metals. It follows that any metal can be used as solder, without affecting the current induced by heating.

The rate of air flow under a given pressure difference is proportional to the density or specific gravity of the fluid. A pressure of 1 oz. per sq.in. will create in the case of water only a sluggish stream. In the case of air, which is more than a thousand times lighter, the velocity will be as high as a mile a minute. For ventilation, this pressure and velocity are seldom exceeded, and efficiency of movement is sought in their reduction to the minimum consistent with the cost of the passage or conduit of greater area.

On account of the importance of a minute quantity of impurity in the pure metal used in a thermo-couple, it follows that no two couples made from different ingots will have exactly the same e.m.f. When couples are to be used in large number, it is a good plan to order a supply of wire made from a single ingot. The wire lot should be sampled at both ends and at the middle, and all samples standardized. If all the samples give the same results the wire lot may be considered uniform, and no further standardization is necessary.

In power plant work, electrically-driven auxiliaries are valuable to a certain extent. When, however, electric drive is used for feed-water pumps, it is apt to partake too much of the nature of carrying all of one's eggs in one basket. Disarrangement of a single circuit may throw out the entire plant, where if steam feed-pumps were used, such would not be the case. As a matter of fact, steam feed-water-pumps are a good means of insurance, even when electrically-driven pumps are used in regular operation.

Sacramento hill, in Bisbee, Ariz., sticks up like a red campaign hat from the enclosing limestone. It is surrounded on three sides by orebodies, irregular in shape, of varied thicknesses, and of undetermined depth; in some cases reaching to the surface, in others with the upper boundaries 1200 ft. underground; these are of unknown shape, area and character; they are chiefly in Carboniferous limestone. Sectors of this circular plane around Sacramento hill, from the Czar shaft on the northwest to the Junction on the east, inclose great mines in every case but one; and that one has been delayed in its development simply by an excess of water.

The economizer for heating feed-water is a valuable adjunct to the power plant; but when economizer surface is provided to the extent that it acts as a series of baffles and prevents the ready egress of the gases of combustion, it has been carried too far. As a general rule, it can be stated where the load factor exceeds 25 per cent., the investment in economizers will be justified. The influence of the economizer upon the draft, due to obstruction offered by it, and due also to the lower temperature in the stack, is important, and each particular case should be considered as an equation in which the interest and depreciation charges combined are offset against the saving in fuel. This is really the only method of solution of the problem.

The two molecules of water contained in gypsum may be expelled at a temperature of about 392 deg. F. A large part of this water may be driven off at a much lower temperature, and if the material is finely ground and is well stirred during the heating, about three-quarters of the water may be expelled at a little below the boiling temperature of water, or about 205 deg. F. The quality of the plaster made by calcining gypsum at temperatures above 338 deg. F. is not changed so long as the temperature does not exceed 390 to 430 deg. Above this temperature the plaster ceases to absorb water with avidity and sets only after a long interval of time. If calcined at a temperature of 650 deg., it cannot be slaked in the ordinary way. Such plaster is called "dead burned."

THE ENGINEERING AND MINING JOURNAL

Contents.

	PAGE
Editorials:	
Mining on a Large Scale	1245
Utilizing Waste Gases	1245
Low Cost of Mining and Milling	1245
Government Ownership of Coal in Germany	1246
Niagara Falls	1246
The Use of Iron and Steel Supports in Mining	1246
Notes on Some of the Less Common Metals in the West of England. *J. H. Collins*	1225
The Zinc Corporation. *Special Correspondence*	1226
*The Lake Champlain & Moriah Railroad ..... *J. H. Granbery*	1227
Thorium Nitrate	1228
*Arizona and Sonora—V. *D. E. Woodbridge*	1229
The Works of the United States Zinc Company at Pueblo, Colorado. *O. Pufahl*	1232
Tin Production in the Black Hills. *Special Correspondence*	1232
*Zinc-Ore Mining in Wisconsin. *Staff Correspondence*	1233
New Copper Deposit in Ontario. *Special Correspondence*	1235
*The Stamp Mill and Cyanide Plant of the Combination Mines Company at Goldfield, Nevada..... *M. R. Lamb*	1236
Transvaal Mining Notes. *Special Correspondence*	1238
Tin Production in China	1238
The Remington Salt Company, *C. S Palmer*	1238
Experiments With a Campbell Fan	1238
*Coal Mining by Open Stripping in Pennsylvania ..... *F. W. Parsons*	1239
*Recent Developments in Electric Mine Haulage	1241
The Explosion Hazard of Electrical Appliances in Collieries	1242
The Yampa Coal Field, Colorado	1242
Colliery Notes	1243
Metallics	1244
Relations of Railway Transportation to Mining and Metallurgy	1247
The London Meeting of the A. I. M. E.	1247
Correspondence and Discussion:	
The Riots at Cananea.... *G. A. Laird*	1248
The Anchor Tin Mine.... *J. B. Lewis*	1249
Mitchell Mining Company. *Geo. Mitchell*	1249
New Publications	1250
Questions and Answers:	
Users of Mica	1250
Abstracts of Official Reports:	
*Alaska Mexican Gold Mining Company	1251
Patents	1252
Personal	1253
Obituary	1253
Societies and Technical Schools	1254
Industrial	1254
Trade Catalogs	1254
Construction News	1253
Special Correspondence	1255
General Mining News	1262
Foreign Mining News	1265
Markets	1265

*Illustrated.

Mining on a Large Scale.

The iron ranges of the Lake Superior region are at work on a scale which indicates production for the year even beyond the enormous output of last season. Several of them are prepared to move and ship this year quantities unprecedented in mining history. Thus the Mountain Iron has all arrangements made to ship 3,000,000 tons this season; the Burt, the Stevenson and the Fayal will handle 2,000,000 tons each; and several other mines will exceed 1,000,000 tons each. All these mines are on the Mesabi range, which is the youngest of the Lake Superior districts, but is well named, for Mesabi in the Chippewa tongue means "the giant." This year it is expected to furnish 25,000,000 tons of the probable total of 40,000,000 tons for the whole Lake region.

The magnitude of these figures will be appreciated, when it is remembered that a shipment of 3,000,000 tons from one mine in the season of navigation means the handling of 13,500 tons of ore daily; the hauling of 270 of the largest cars—50 tons—from the mine by rail; and the loading of nearly two average Lake steamers each day at the Duluth docks. If only the largest carriers were used, 300 cargoes would be the least possible number, or four each three days of the season.

Utilizing Waste Gases.

The utilization of the waste gases from blast furnaces to furnish power, which has made large progress in Germany and France, and to a less extent in Great Britain, has been tried on a large scale in this country only at one plant, though some smaller works have applied it for that purpose. In most cases its only use has been in the hot-blast stoves.

Now. however, it seems as if this obvious waste and loss of present practice were beginning to be realized. In the plans for at least two important works, provision is made for utilizing these gases. In the large extension of the steel works of the Tennessee company at Ensley, the gases from the blast furnaces are to be used for generating electricity; whether directly through gas engines, or as fuel for raising steam is not yet, we believe, fully decided. Possibly both plans may be tried. In the great new plant which the Steel Corporation has started at Gary, near Chicago, gas-driven blowing engines will be used for the blast furnaces, and gas engines for generating electric power also.

It is well that in these important cases some of the wastefulness of our present practice should be recognized, even if it is rather late in the day. We have plumed ourselves on our success in working fast and on a great scale; forgetting or ignoring the fact that at the same time we were making wastes and losses which our German competitors would not tolerate for a day.

Low Cost of Mining and Milling.

The communication from Mr. Lewis, which is published elsewhere in this issue, is of particular interest, in reporting the itemized cost of mining and milling at Anchor tin mine in Tasmania. The mining and milling of ore for 58c. per ton of 2240 lb., as the average for a year's work, with the prospect that this cost can be further reduced to about 50c. per ton, is certainly a remarkable achievement, although the general expense is not included. The cost of milling figures up to about 21.9c. per ton, which is about the average result obtained in the milling the low-grade native copper ore at Lake Superior on a very much larger scale; the cost of mining is only 36.44c. per ton, or if reduced to the short ton, less than 33c. We should not venture to say that this figure is the lowest on record, but certainly, it is not very far from it. It is attained, as explained by Mr. Lewis, under extremely favorable conditions for mining.

We fully agree with Mr. Lewis as to the need for discounting estimates of the probable yield of low-grade deposits of tin ore, but in our estimate of a probable yield of 10 lb. of tin per ton of ore in the case of some of the mines of the Black Hills, we are of the opinion that all necessary discount was made. The tin-ore deposits of the Blue Tier, Tasmania, are extremely interesting, especially in view of their apparently unparalled magnitude. The tin-ore deposits of the Black Hills are also believed to be large, but in this respect they are very much inferior to those of the Blue Tier, and, moreover, are of quite a different class.

Government Ownership of Coal in Germany.

It will be remembered that, about two years ago, the Prussian government—not

the Imperial German government—acquired a large ownership of the stock of the Hibernia Coal Company, the largest coal mining concern in Germany, and a leading factor in the Rhenish-Westphalian Syndicate. It did not hold a majority, however, but desiring to control the company, made an offer to purchase the remaining shares. This was strongly opposed by the larger owners, and at a rather exciting meeting the Government proposition was rejected. Moreover it was voted to increase the capital by $1,625,000, and the new stock was promptly taken by the opponents of the sale, giving them an undoubted majority, even if the smaller holders should weaken and sell to the Government. The increase of stock was questioned by the Government; but the Reichs-gericht, the highest court of the Empire, has just decided that it was legal and valid. This puts an end for the present to the attempt of the Government to control the company.

The reason given for the action taken at the time was that the Government desired to secure coal supplies under its own control for the State railroads and the navy. The leaders in the Hibernia company, however, looked on it as a first step toward government ownership, or at least control, of the coal trade; and they opposed it accordingly. It is understood that the project has not been given up. The Government holds about 40 per cent. of the $15,000,000 stock of the Hibernia, but has not taken any farther step toward acquiring more, so far as is known. That the decision against it may be the occasion of some new move is feared by the Hibernia directors.

Niagara Falls.

The bill for the preservation of the waters of Niagara river and Niagara Falls, which has been pending at the present session of Congress, has finally been agreed to by the Senate and the House, and will undoubtedly receive the signature of the President. As finally agreed upon, the bill increases the amount of water which may be diverted from the American side of the river to 15,600 cu.ft. per second, in addition to what is already being taken, but further provides that the Secretary of War shall issue no revokable permits for the subtraction of water until the limit of 15,600 cu.ft. has been tried for at least six months, in order to note the effect of the withdrawal of water upon the scenic beauty of the Falls. It is to be expected that the Canadian Parliament will pass a similar measure with respect to the diversion of water on the Canadian side, the present act of Congress being in conformity with the recommendation of an international commission appointed to consider measures for the preservation of the Falls.

This matter is of great interest and importance to the metallurgical and chemical industry, because Niagara Falls has become by virtue of its cheap hydroelectric power, together with its proximity to Buffalo, and the other large cities of the East, the chief center of electrochemical and electrometallurgical industry in the United States. The amount of water which may be diverted will enable the Pittsburg Reduction Company to obtain the additional power that it desires, an increase over the 13,200 cu.ft. per second, as provided in the bill as it passed the House having been made for this purpose. This will enable the company to increase the production of aluminum at its works at Niagara Falls.

Niagara Falls has been characterized by certain materialists as the most expensive luxury that is maintained by the United States, this opinion being based, of course, upon the available water power which is now allowed to go to waste. However, there are many, ourselves included, who will not admit that this waste is really a loss. It would be a poor sort of a world that was entirely given over to smelting works and factories, and the preservation of Niagara Falls appeals to the best that is in us, and certainly meets with the approval of the majority of American citizens whose opinions are worth considering.

The Use of Iron and Steel Supports in Mining.

Attention was recently called to the action of one of the larger American mining companies, toward reforesting its extensive tracts of land, which have been entirely stripped of their timber. This company uses several million feet of timber each year in its mines. The scarcity of timber on the lands of this company is typical of a condition which exists in most of the mining districts of this country. The reckless, indiscriminate cutting that has occurred in all the newly developed mining regions, has resulted in these local timber famines. The Government, through its forestry department, has now attempted to correct the fault, and it is hoped that the virgin forests which remain will not be destroyed in so reckless a manner as heretofore.

Much consideration has been given to the substitution of other material for mine supports. In Great Britain and on the Continent, this problem has been studied for many years, and as a result, iron and steel supports are used in many mines. In some instances, even greater expense has been incurred, by lining the main haulway with brick, but this seems unnecessary, except where the life of the roadway is expected to extend over a great many years.

Iron and steel supports, however, are no longer an experiment, and under certain conditions are certainly to be recommended, especially in collieries. In return air-ways where the air is hot and foul, besides containing much moisture, wood rapidly decays and requires frequent renewals; in such places steel supports may advantageously be used. Steel props are more expensive than timber props, and it is therefore essential that they should be used only where they can be withdrawn and re-set.

The girders and props, generally used, are either of the H or T-rail sections, although hollow cast-iron supports have been employed in some collieries. Comparing the cost of supporting roadways with timber, and the cost of steel girders and props, it is found that the first cost of the latter will be twice as much, but they will last four to six times longer, give a greater warning of danger by bending, besides affording an increased margin of safety. Experiments with cast-iron props have determined that supports made of this material are not only heavy, but are easily broken.

The advantages attending the use of steel supports are chiefly due to their lightness and ease of handling as compared with timber. It is also to be remarked that they occupy a smaller amount of space than timber, do not pollute the air, and do not have any risk of catching fire.

THIS YEAR, for the five months to the end of May the Transvaal has reported a total of $45,070,000 gold, which would indicate a total of considerably over $100,000,000 for the current year.

Relations of Railway Transportation to Mining and Metallurgy.

On June 12, the students and faculty of Applied Science of Columbia University were addressed by Dr. James Douglas, president of the Copper Queen Consolidated Mining Company, on "Some of the relations of railway transportation in the United States to mining and metallurgy." The paper was valuable in its detailed statistics which are difficult to condense. Starting from the period (about 1830) of the first railways in England and the United States, large enough to be commercial factors, Doctor Douglas traced the growth of the railway, and the increase of tonnage of iron ores smelted. Thus the stimulus given to the iron trade in England in 1830-40, by the construction of 3000 miles of railroad, raised the production of pig iron from 677,417 tons to 1,396,400 tons in 1840. She mined about 50,000 tons of coal, made 11,500 tons of copper, about 58,000 tons of lead, and 4,400 tons of tin. Since then her railroad mileage has increased to 22,700, her production of pig iron to 9,000,000 tons; her lead production, however, has declined to 20,000 tons, and her production of copper has become a negligible quantity; her tin production has not increased.

Meanwhile, our production of pig iron has risen to 22,822,380 tons (from 135,940 tons in 1830); our coal, from 209,000 tons in 1830, to 314,562,880 tons; copper from nothing, to 462,000 tons; and our lead from 10,000 tons in 1830, to 322,886 tons. These results have been in keeping with and dependent on the growth of the railroads. The early railroads were laid with "strap rails"; T-rails were not rolled in this country till 1844.

Pennsylvania early held the chief place in smelting by reason of her home supply of ore and coke. Yet today, by reason of railroad facilities in bringing ore from the Northwest, she is independent of local ore. In 1904, Pennsylvania furnaces made 7,644,321 tons of pig iron; yet her own mines turned out only 397,107 tons of iron-ore. Herein lies the potency of transportation. Pittsburg possesses coal and coke; Michigan and Minnesota have the largest, finest, and (considering their quality) the most cheaply mined ores in the country. It is, at present, cheaper to bring the ore to the fuel (and to the people who buy and consume the iron), than to take the fuel to the ore and carry back most of the finished product.

The revolution in the last half-century, in the iron branch of metallurgy has been brought about by the railroad and the steamboat. Of the 50 million tons of iron ore treated in this country last year, 34,353,456 tons came from the Lake Superior district.

Among the strange contradictions is the persistency with which the copper-and-brass trade has adhered to the Naugatuck valley in Connecticut. Some of our large iron works are now also in ill suited conditons; but they were originally started near small iron deposits which are now exhausted.

But it is not only in the iron trade that low rates of carriage have helped the metallurgist. Montana copper largely draws her coke from Pennsylvania, or from ovens on Lake Superior, fed with Pennsylvania coal. The Copper Queen, after depending on foreign coke at exorbitant rates, now brings it at one-third the cost from northern New Mexico, though over a haul of from eight hundred to a thousand miles, and uses oil from Texas and California brought in at a rate not exceeding ¾c. per ton per mile.

The interdependence of mines and railroads is also shown in the mines of Butte which largely send their ore to Anaconda (26 miles at 14c. per ton); or to Great Falls (170 miles) where advantage is taken of water power. Another instance is the shipment of copper-matte from Tennessee to the heart of Mexico, where it has been used to collect gold and silver from "dry ores," the black copper being returned to the United States for refining and separation of the gold-and-silver content. Again, the Globe district, Arizona, languished for want of sulphur- and iron-flux; but the railroads issued a tariff which brought in pyrite from distant districts. As a result, the production rose rapidly to three million pounds of copper per month.

Doctor Douglas commented also on the wasteful consumption of our supplies incidental to our great railroad development. He said: "But, vast as our resources are, they are not inexhaustible. Mr. Carnegie, in his St. Andrew's address, assigned to our own iron deposits a life of 60 years, while Professor Shaler, in his book on the 'Earth and Man,' reduces that span to 50 years. Our anthracite is a rapidly vanishing quantity, and, vast as are our bituminous-coal fields they will not last forever. And we are using nature's resources with most wasteful prodigality. We are saving only 60 per cent. of our anthracite, burning away the by-product of 90 per cent. of all our coke ovens, and cutting down our vast forests without replanting. In fact, except in the Northwest, our timber resources are almost exhausted, and we are borrowing largely from Canada and from abroad. And we shall sooner or later have to borrow more than timber. When we reach that stage, we will make less money, which will be far from an evil, for it may oblige us to replace some of our pelf with humility and meekness of spirit.

"As our resources fail, however, we shall not lack for raw material, as long as the world's supply lasts, for transportation charges by land and water will grow steadily less, and we cannot but believe that many of the selfish barriers which now separate nations commercially will be swept away by the spread of saner notions on political economy, and more unselfish international relations.

"Selfishness may build tariff walls against trade, and folly or ambition embroil nations in war; but no one has yet been able to confine the divine prerogative of free thought, or of free speech, by those brave enough to use it."

The London Meeting of the A. I. M. E.

The following communication from Dr. Raymond, and the appended notice are self-explanatory.

Sir—I transmit herewith a statement of the provisional program of the sessions and excursions of the London meeting of next month. These details have not been, and will not be, issued by official circular from this office, because experience has shown that such official announcements, even though avowedly provisional, are likely to be relied upon by members as final, unless they are carefully corrected by successive later announcements. This objection does not apply to the publication of such a statement in your columns; and I therefore place it, together with this explanation, at your disposal. R. W. RAYMOND.
Sec'y.

New York, June 21, 1906.

For the joint meeting of the Iron and Steel Institute and the American Institute of Mining Engineers, to be held in London from July 23 to August 4, and for the subsequent excursions in Great Britain, etc., the following program has been provisionally arranged by the London Reception Committee:

Monday, July 23—American visitors arrive and register at the office of Prof. Bennett H. Brough, Secretary of the Iron and Steel Institute, 28 Victoria St., London, S. W.

Tuesday, July 24—Morning: Session at the rooms of the Institution of Civil Engineers. Afternoon: Visit to physical laboratory, or to the royal mint, or reception at Armorers' and Braziers' Hall. Evening: Lord Mayor's reception at Mansion House.

Wednesday, July 25—Morning: Session. Afternoon: Visits to works of J. I. Thornycroft, I. & E. Hall (refrigerating machinery), or the Temple and Inns of Court. Evening: Fête at Earl's Court Exhibition.

Thursday, July 26—Morning: Session. Afternoon: Visits to works of Fraser & Chalmers, or other works, or Reception at Ironmongers' Hall. Evening: Fireworks and supper at Crystal Palace.

Friday, July 27—Morning and afternoon: Probably, excursion to Windsor. Evening: Institute banquet at the Guildhall.

Saturday, July 28—Visit (a) to blast-furnaces at Wellingborough, or (b) to Dover harbor and colliery.

The American visitors have been elected temporary members of the Whitehall, St. Stephen's and Royal Societies' clubs. On Sunday, July 29, they will be invited to visit the Royal Botanic gardens and the grounds of the Zoological Society.

SUPPLEMENTARY EXCURSIONS.

Monday, July 30. American guests leave London for York—a party visiting Denaby main colliery on the way.

Tuesday, July 31. Visit to Teeside, with alternative visits to works, and a public luncheon at 2 p. m. in Middlesbrough Town Hall. The ladies of the party will go from York to Fountains Abbey, Durham and Newcastle, where the party will spend the night.

Wednesday, August 1. Visits to works and collieries at Newcastle, and a Conversazione in the evening.

Thursday, August 2. To Glasgow via Carlisle, visiting Roman remains en route. The night will be spent at Glasgow.

Saturday, August 4. Journey by special train from Glasgow to Edinburgh (with visits to the Forth Bridge, Rosslyn Chapel, Holyrood Palace and Edinburgh Castle). The tour will end here.

As an alternative tour, American visitors are invited to attend the meeting of the Institution of Mechanical Engineers, which begins at Cardiff, Wales, on Monday, July 30. The provisional program of this meeting is as follows:

Monday, July 30. Arrival at Cardiff.

Tuesday, July 31. Morning: Reception by the Lord Mayor, etc., followed by session in the hall of the South Wales Institute of Engineers. Afternoon: After luncheon, visits to important works in and near Cardiff. Evening: Reception.

Wednesday, August 1. Morning: Session. Afternoon: After luncheon, visits to works. Evening: Institute Banquet at Park Hall, Cardiff.

Thursday, August 2. Morning and afternoon: Visits to works.

Friday, August 3. Excursions to places of interest in the districts of Cardiff, Barry and Newport, returning in the evening to Cardiff.

A special committee will provide for the entertainment of ladies during the meeting.

After the excursions in England and Wales, a brief visit (in which a large number of members have signified their intention to participate) will be made to Germany, upon the invitation of the Association of German Ironmasters. The party will be received at Düsseldorf, Monday, August 13. The program will occupy about four days. A subsequent excursion to Hannover and the Harz will be organized, if desired; and members will be assisted as far as possible in such further professional visits as they may individually desire to make. Full particulars of all these plans will be given to members upon their arrival and registration in London, July 23, or upon inquiry by letter, addressed to Dr. E. Schroedter, Association of German Ironmasters, Düsseldorf, Germany.

The following papers will be presented at the London meeting on the part of the American Institute of Mining Engineers:

1. Comparison of American and foreign rail-specifications, with a proposed standard specification to cover American rails rolled for export, by Albert Ladd Colby, New York, N. Y.

2. Improvements in iron and steel, by James E. York, New York, N. Y.

3. Piping and segregation in steel ingots, by Henry M. Howe, New York, N. Y.

4. Effects of low temperature on the recovery of steel from overstrain, by E. J. McCaustland, Ithaca, N. Y.

5. A simple distributor for blast-furnace charges, by David Baker, Philadelphia, Pa.

6. A new colorimeter for the determination of carbon in steel, by Chas. H. White, Cambridge, Mass.

7. The gas-producer as an auxiliary in iron blast-furnace practice, by R. H. Lee, Liberty Furnace, Va.

8. Internal stresses and strains in iron and steel, by Henry D. Hibbard, New York, N. Y.

9. Heat-treatment of steels containing 0.50 and 0.80 per cent. of carbon, by C. E. Corson, Latrobe, Pa.

10. Methods of mining, hauling and screening coal at the mines of the Aldrich Mining Company, Brilliant, Alabama, by T. H. Aldrich, Jr., Birmingham, Ala.

In addition to the above list, a considerable number of papers not relating to the subjects named have been accepted, to be read "by title" at the meeting, for subsequent publication. This list will be read at the London sessions.

The following is the provisional Düsseldorf program:

Monday, August 13. Arrival of guests, and informal reception in the Park Hotel.

Tuesday, August 14. Excursion by special steamer to various works on the Rhine, etc., with special side-excursion for the ladies. Lunch and supper on the steamer, and an evening reception given in Düsseldorf by the Mayor.

Wednesday, August 15. Excursion of the ladies to points of interest in Düsseldorf, and visits by the gentlemen to shaft No. 4 of the Rhenish-Prussian colliery, or the Phœnix and Rhenish steel works, or the Gutehoffnung smelting works.

Thursday August 16. General excursion to Vohwinkel, Elberfeld, Barmen, Tölleturm, Talsperre (where luncheon will be served), Remscheid and Solingen, returning to Düsseldorf in the evening. This trip will include not only fine scenery, but also many interesting novelties, such as the one-rail elevated road, the electro-smelting at Lindenberg, etc.

Friday, August 17. Excursion on the Rhine, by early train to Coblenz, and subsequent steamer trip up the river to St. Goar, and back to Cologne.

Correspondence and Discussion.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the columns of the JOURNAL.

Letters should be addressed to the Editor.

We do not hold ourselves responsible for the opinions expressed by correspondents.

The Riots at Cananea.

Sir: With reference to the recent troubles in Cananea, together with the grossly exaggerated newspaper reports, will you kindly allow me a small space in your valued paper?

First of all, let me state that in the recent difficulties of the Cananea Consolidated Copper Company, the reports of "Eye Witnesses," etc., were mostly given by parties who took the first train out of the camp, and their only idea of the situation was to get away as soon as possible, never considering the property of their employers, to say nothing of the women and children who could not leave.

The recent troubles were not solely labor troubles, as we all know, and what I wish to state is, that if the people who have been telling their wonderful tales of the "barbarous" and "revengeful" Mexican do not like the existing conditions of this Republic, I after years of residence in Mexico, have yet to learn of a law compelling them to stay here, unless it be the law of "self protection" (from our own judiciary department).

I am an American to the backbone, a Yankee through and through, and all that I can say is that the Englishman, the German, the Frenchman, or any other foreigner, who lives in the United States, is told by the American-Yankee—of whom I am proud to be one—just what the Mexican tell the foreigner: viz. "If you don't like our country, get out of it."

I do not care to enter into a discussion regarding the Mexicans, but why cannot the American, broad-minded as he is—or should be—have patience with a race which has done, and is doing, that which we Americans admire—progress?

The labor troubles here were simply local, and the result of the conflict is deplorable; but do not let the American people judge Mexico by the recent event. If they must be the judges, condemn Cananea, but not the entire country so ably governed by General Porfirio Diaz.

I do not sympathize with the labor movement, nor with the so-called Liberals, or supposed revolutionists, nor with any other faction; neither am I a "peace at any price" advocate, but I do believe, having a close knowledge of the Mexicans

and Mexico, that the "yellow journals" and the "eye witnesses" are better off in the United States (my own country) as long as they are allowed to exist, much as I regret their existence.

GEORGE A. LAIRD.

Cananea, Sonora, Mexico,
June 11, 1906.

The Anchor Tin Mine.

Sir:—In your issue of March 10, 1906, is an editorial on Tin Mining in the United States, in which you state that ore yielding 10 lb. of metallic tin per ton can probably be produced in South Dakota, and that this could be worked profitably, and you instance this mine (the Anchor, Tasmania) as being able to work profitably on a yield of 5 lb. per ton. We can work profitab'y on a yield of 5 lb. black tin (tin oxide) per ton, or 3.5 lb. metallic tin (as our ore assays about 70 per cent.) and you will see that at the present price for tin that gives us a very fair profit, the gross return being about 5s. 7d. per ton. The following is a brief analysis of our working costs for the last financial year, ending June 30, 1905. The figures represent pence and decimals of a penny.

	Labor.	Stores and Renewals.	Explosives.	Totals.
Quarrying	10.58	.27	2.16	13.56
Maintenance of plant	.55			
Trucking	1.90	.07		1.97
Crushers	1.18	.38		1.56
Battery, running	2.20			
" tin dressing	2.03	2.43		8.50
" repairing	1.84			
Power (maintenance races)	.89			.89
Stripping and developing	.50	.01	.03	.54
Mine office	.35			.35
Sampling	.26			.26
Sundries	.28	.15		.43
Freight				.66
Horse feed				.45
	22.56	3.31	2.19	29.17

Quantity of ore treated for 12 mo.. 118,634 tons
Average assay..... 69.1%
Average number of stamps crush'g 74.25(out of 100)
Stone per stamp crushed in 24 hrs. 4.98 tons
Cost per ton at the mine..... 2 s. 5.17 d.

A matter which materially affected the returns was a drought which caused a shortage of water for seven months, including an entire stoppage for one month, and which reduced the average of the stamps to three-fourths full power, and the total stone crushed by 30,000 tons, and increased the cost per ton materially. Before the drought we had succeeded in getting costs for one month to 2s. 1.5d. per ton, or for six months to 2s. 3.25d. We opened the present year with an unprecedented drought, which has again thrown us back, but with sufficient water power we can keep down to 2s. 2d. and with fair luck get below 2 shillings.

You will observe that our costs are only costs at the mine, and include nothing for management, office, interest, or smelting expenses, nearly all of which are fairly constant whether we crush much or little stone. On an output of 140,000 tons per annum this would add about 8¾d. per ton. Nor is anything allowed for depreciation of plant.

Our wages average 7s. 6d. for a day of eight hours, and our unit of measurement is the ton of 2240 lb., arrived at in the following manner. We have no permanent weighbridge, but the wagons which transport the stone from the crushers to the battery are loaded to their full capacity, and the contents of one taken at random are weighed, an allowance being made for moisture. We take our weights at a little less than the average of these, to allow for an occasional wagon (by some accident) missing the full load.

We have excellent facilities for cheap work. Water power only is used. The stone is quarried in open faces. It is good ground for boring (which is done by hand), and for shooting, only occasionally coming out in big blocks requiring much "popping." It is seldom very hard, is easily reduced by the stone crushers, and freely gives up its tin in the battery, where it crushes well. In fact at the present time, in one shed, with stamps of about 800 lb. we are putting through over six tons per stamp in 24 hours. We lose about 20 per cent. of the tin in the stone, not because the battery makes slime, but because it exists originally in that state in the rock.

Many of our methods are crude and our plant is susceptible of much improvement. In fine weather when work can be done in the open to the best advantage we have not enough water power, and in the winter when there is plenty of water, our output is reduced by clogging crushers, self-feeders, etc., and the men cannot work to advantage. We are gradually improving our methods and our plant, and a scheme to regulate the water supply is under consideration.

If we can do the work for so little, you can surely do it for less, for we look to America for the last word in economical working. On the other hand our experience of lode-tin mining here is not encouraging. We are working on an enormous deposit, the known outcrops covering many square miles, and these pass under the country granite to an unknown extent (we have stripped it to a depth of 40 ft.). The actual extent of these tin formations would possibly run into hundreds of square miles in area, and are of unknown depth. So far we have made the only systematic attempt to work them. The Mt. Lyell Company has secured a very large area and is prospecting a portion of it, and if the investigations disclose 5,000,000 tons of payable ore a large plant will be proceeded with. Other attempts at working are fitful and futile, the reason being the uneven grade of stone. Small patches of payable stone occur in large masses of poor or almost barren stone, and no satisfactory method of prospecting it has yet been devised. In the early days of the Anchor Company the stone, from the information available, was supposed to average 1 per cent. It does not actually average one quarter of that. These deposits in America, to which you refer, may be of the same nature and having caused tribulation to those who have attempted to work them, may have still more tribulation in store for future exploiters. Where an ordinarily careful investigation will show an average of 10 lb., the actual result may be a quarter of that. Cases where 2 or 3 per cent. or even more appear certain in large ore bodies have given not more than 50 per cent. of the anticipated returns and the profits have been swallowed up by the extra handling required in following up these eccentric formations.

You have doubtless seen the various reports on the South African tin discoveries, and remember the case which the first expert reported on as the biggest thing in the world and advised the proprietors to work it carefully lest they should swamp the market and bring down the price of tin. Other reports of gradually diminishing enthusiasm followed, until the last recommended it as a good prospecting show. That is the case with most of the tin formations here; familiarity breeds contempt. It may also be the case with the American deposits you refer to, and their previously unsuccessful treatment may be due to no lack of skill or practical ability on the part of those who worked them, but they may be like many mining ventures, of the most uncertain of which they are typical. And I imagine there is no successful lode-tin mining where alluvial tin mining has not been also conducted on a large scale. But of course mining consists of exceptions to known rules, and also with the high price of tin, circumstances are quite altered, and conditions indicate that it is reasonable to expect it to keep to a fairly high price.

JAMES B. LEWIS,
Manager, Anchor Tin Mine.

Lottah, Tasmania,
May, 1906.

Mitchell Mining Company.

Sir—In your issue of June 23 I find a letter from T. H. France in which he states that his attention has lately been called to a circular, issued by the Mitchell Mining Company, in which he is quoted as endorsing the property of the company at La Dicha in the State of Guerrero, Mexico, to the extent of about 8,000,000 tons of ore, having a value of about $57,000,000.

In justice to the Mitchell Mining Company I request space to contradict Mr. France's untrue statement. No such circular was ever published by me, or by this company, containing statements of Mr. France as to tonnage or value of ore of the Mitchell mines.

About a year and a half ago Mr. France made an incomplete examination of our

properties in the capacity of a sampler for other interests. In his letter to the JOURNAL, after this incomplete examination, Mr. France states that the property showed only 1,800,000 tons of ore averaging 1.86 per cent. copper, and traces of gold and silver. This statement is untrue, and I have in my possession correspondence of Mr. France in which he states that the property from a mining standpoint is most favorable.

We also have data from Mr. France's incomplete samplings showing a much higher average. It is a fact that Mr. France in conversation with E. D. Elson, general manager of the Mitchell Mining Company at La Dicha, and my brother, Harry Mitchell, stated that he considered that the Mitchell properties had the making of the largest mine in Mexico.

I wish to state that there can be no question as to the abundance and quality of the ores at La Dicha. All the ores treated to date have averaged better than 6 per cent. copper at the smelter; 2½ millions of tons of ore blocked out average over 4 per cent. and six million tons average over 3.5 per cent. This is according to the General Manager E. D. Elson, Mine Superintendent E. E. Noon, and Geo. D. Case, metallurgist and mine superintendent at the Mitchell properties, all of whom are competent and capable mining men, standing high for truth and integrity.

The company now has in operation a 200-ton smelter, and the first converter was to have been blown in today. Plans are rapidly maturing for the completion of the railway.

Our difficulties in opening this mine have been great, but all impartial witnesses testify that they have been competently dealt with. To have an uncalled for and unjust criticism of the nature of that made by Mr. France at this time and date is unfortunate.

GEO. MITCHELL.
President, Mitchell Mining Company.
New York, June 26, 1906.

New Publications.

"Mining in Switzerland." By H. Bueler de Florin. Pp. 62; illustrated. 5x8 in.; paper, 30c. Frankfort, Germany, 1906: *Der Erz Bergbau.*

"Iron Metallurgist's Annual," Vol. iv. By Otto Vogel. Pp. 464, illustrated. 6x10 in., cloth, $3. Dusseldorf, Germany, 1906: *Stahl und Eisen.*

"The Theory, Design and Construction of Steam Turbines." By Gabriel Zahikjanz. Pp. 179. 7x10 in.; paper, $1.50. Berlin, 1906. Krayn.

D. Houston & Company, well known metal brokers of New York, have issued their regular annual publication on copper. This is a neatly bound book of 164 pages, giving details of the capitalization, organization and production of the principal copper producing companies of the United States, together with general statistics of production, stock market quotations, etc. It is a useful and convenient reference book.

"City Roads and Pavements." Third edition, revised. By William Pierson Judson. Pp. 197; illustrated. 6x9 in., cloth, $2. New York, 1906: Engineering News Publishing Company. London: Archibald Constable & Co., Ltd.

Contents: Preparation of streets for pavement. Ancient pavements. Modern pavements. Concrete base for pavements. Block stone pavements. Concrete pavements. Wood pavements. Vitrified brick pavements. American sheet asphalt, artificial and natural. Bitulithic pavements. Broken-stone roads.

The publication of the *American Manufacturer* in Pittsburg ceased with the issue for June 21, after an existence of 39 years. For 28 years of this time, the paper held a high position under the control of the late Joseph Weeks, so well known to the iron and steel trade. Since his death in 1898 its fortunes have been varied. Recently the stock of the National Iron and Steel Company, the publisher, passed into the hands of L. L. Carson and others, who have considered it best to close the existence of the old paper. Its place will be taken by a new journal called the *Industrial World*, which will have a wider field in the iron, coal and coke industries, and will seek to represent Pittsburg and its manufacturing interests in an adequate way.

"Electrical Engineering in Theory and Practice." By G. E. Aspinwall Carr. Pp. 447; illustrated. 6x9 in.; cloth, $3.25. London, 1906: Macmillan and Company, Ltd.

Contents: Fundamental principles of magnetism. Fundamental phenomena of statical electricity. Fundamental principles and units of electricity (current). Electrical resistance. Electromagnetism. Electrostatic and electromagnetic induction. Electrical and magnetic instruments. Electric incandescent lamps. Electric arc lamps. The production of electromotive force (thermo-generators —primary cells—secondary cells).

The author of this book is an associate of the Central Technical College, City and Guild of London, and head of the engineering department of the university at Leeds. He states in his preface that every endeavor has been made to produce a work, which (while being fully up-to-date) excludes all historical matter and obsolete appliances, except in a few cases where they embody important principles. It includes the treatment of fundamental matter, which although elementary in nature, is important and should be known by an electrical engineer.

"High Tension Power Transmission." Vol. II. Pp. 315; illustrated, 5x5½ in.; cloth, $2.50. New York, 1906: McGraw Publishing Company.

Contents. Electrical power transmission, by Charles F. Scott. The high tension transformer in long distance power transmission, by John S. Peck. Notes on experiments with transformers for very high potentials, by Harold B. Smith. High potential, long distance transmission and control, by F. G. Baum. American practice in high tension line construction and operation, by F. A. C. Perrine. Spark distance corresponding to different voltages, by H. W. Fisher. The Use of Aluminum as an electrical conductor, by H. W. Buck. Conductors for long spans, by Francis O. Blackwell. High tension insulators, by V. G. Converse. The construction and insulation of high tension transmission lines, by M. H. Gerry, Jr. Some difficulties in high tension transmission and methods of mitigating them, by J. F. Kelly and A. C. Bunker. Pioneer work of the Telluride Power Company, by P. N. Nunn. Bay Counties Power Company's transmission system, by L. M. Hancock. Some practical experiences in the operation of many power plants in parallel, by R. F. Hayward. Maximum distance to which power can be economically transmitted, by Ralph D. Mershon. Some elements in the design of high pressure insulation, by Harris J. Ryan. Insulating materials in high tension cables, by E. Jona.

This book is a republication of a series of papers and discussions presented at the International Electrical Congress in St. Louis, 1904. The preface to the volume is written by Louis Bell, who says in conclusion that it gathers from sources not always conveniently accessible, the best judgments of experts regarding some highly important topics, delivered at a recent date, and puts them all together where they can be consulted when necessary. There is not one of them but will repay careful study, and their aggregate forms a landmark in the art from which the bearings of future progress may be taken.

Questions and Answers.

Users of Mica.

Who are the principal users of mica in the United States? R. E.

Answer.—The following are large dealers and consumers: Eugene Munsell & Co., 218 Water St., New York; A. O. Schoonmaker, 221 Fulton St., New York; General Electric Company, Schenectady, N. Y.; Westinghouse Electric Manufacturing Company, Pittsburg, Penn.; National Gum and Mica Company, 502 W. 45th St., New York.

According to Robert N. Bell, State inspector of mines, the production of Idaho in 1905 was 60,516 oz. of gold, 8,626,794 oz. of silver and 260,791,456 lb. of lead.

Abstracts of Official Reports.

Alaska Mexican Gold Mining Company.

This is a California company, controlled by the Exploration Company, Limited, London, and the Compagnie Francaise De Mines D'Or & De L'Afrique Du Sud, Paris. The mines are situated near the famous Alaska-Treadwell mine, at Treadwell, Douglas Island, Alaska. The report covers the fiscal year ending Dec. 31, 1905, and deals with the Mexican and 700-ft. mines.

During the year dividends amounting to 53 per cent. on the par value of the issued stock and totalling $477,000 were distributed, and a balance of $111,995 was carried forward.

The company's 120-stamp mill crushed 233,985 short tons of ore during the year for a return of $745,189. The actual running time of the mill was 354½ days. Steam was used for power for 226 days and water for 128½ days. During the whole period, according to the accurate detailed accounts of the company's operations, kept by the officials, each 1 lb. of chrome steel in the shoes crushed 2.35 tons of ore, and each 1 lb. of iron in the dies (which were made in the Treadwell foundry) crushed 4.28 tons of ore at a cost of $0.0292 per lb. per ton of ore crushed. The average loss of quicksilver in the mill amounted to 33 per cent.. The average milling cost was $0.28 per ton; of this amount labor cost $0.09, supplies $0.035, foundry expenses $0.017, steam power $0.101 and electric light $0.0016.

Fig. 1 illustrates the development in the Mexican mine. The main shaft has been sunk to a depth of a little over 1200 ft. The total development of the mine now embraces the following: 32,835 ft. of drifts and crosscuts, 15,436 ft. of raises, 622½ of stations and skip chutes, 262 ft. of winzes, and 1463 ft. of shaft. The 660-ft. level west stopes yielded the largest quantity of ore. No. 3 west stopes from this level yielded over 11,000 tons, and there are 14,000 tons of $3 ore opened in this stope ready for mining. In the 770-ft. level, large bodies of $3 ore are developed. In the 880-ft. level the orebody is 44 ft. wide. The average assay value of the first 21 ft. is $5.39, the remaining 23 ft. is low-grade ore. The tonnage developed ready for mining is estimated at 841,900 tons of average value of $3.20 per

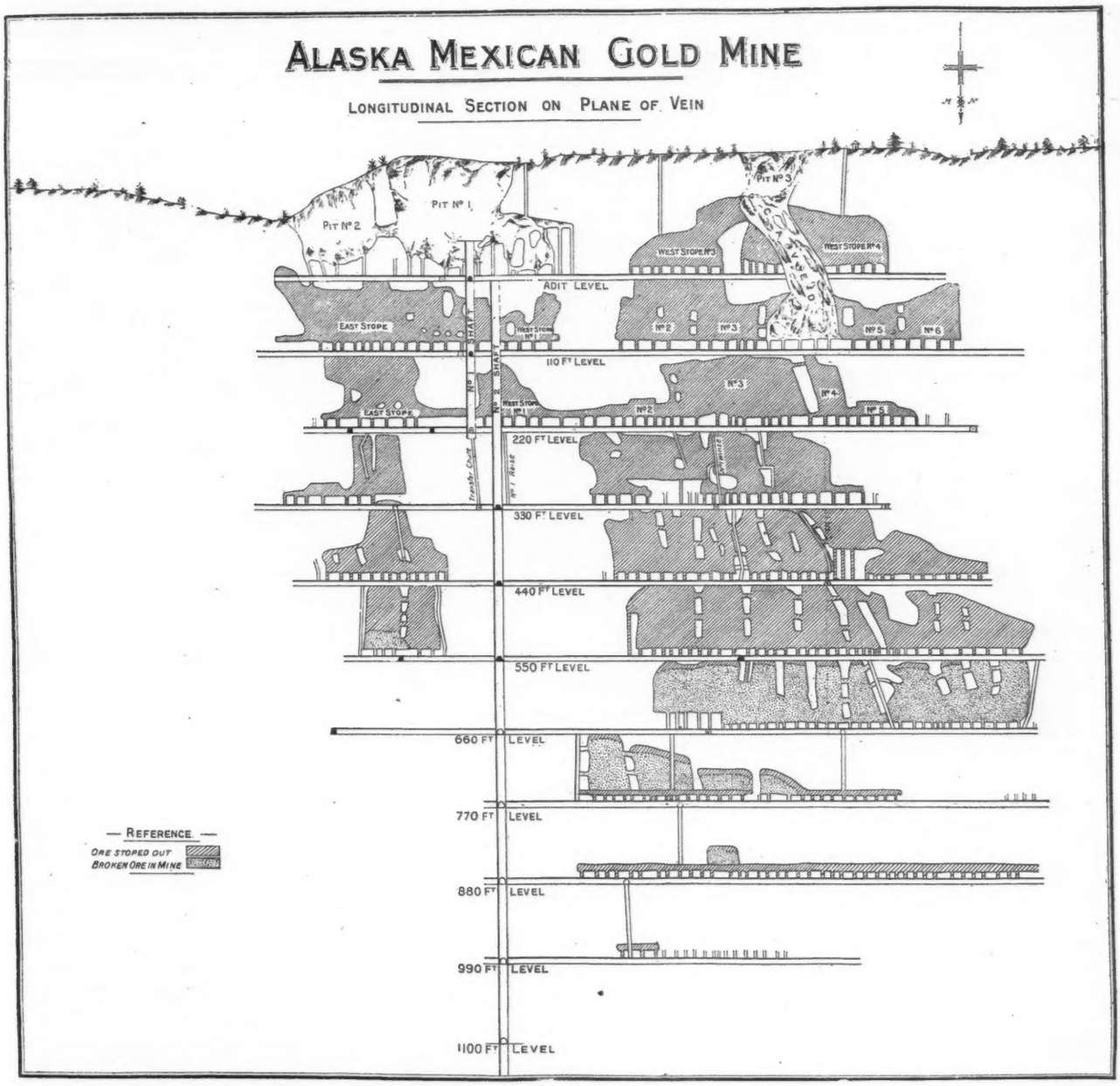


FIG. 1.

ton. The 700-ft. mine yielded 23,877 tons of $2.87 ore during the year.

Although the mine is remotely situated labor for all departments throughout the year was plentiful. The following are the current rates of pay ruling along the seacoast of Alaska: Machine drillers, $2.50 per day with board and lodging; machine helpers, $2.25; mine laborers (white) $2, (Indian) $2 without board; blacksmiths $4 with board and lodging, and tool sharpeners $3.50. The average wages, including cost of board and lodging, is about $3.15 per day. The average cost of the company's boarding house, including all meals, was $0.57 per day per man, notwithstanding that the food was of the best and in abundant quantity.

On the average, 17.11 machine drills were daily employed in the Mexican mine. Each machine during a shift drilled 36.6 ft., which resulted in the breaking of 27.9 tons of rock, at a cost of $7.95 for labor, and $2.75 for explosives. The average cost of mining, raising, sorting and delivering ore to the mill amounted to $1.419 per ton.

Patents Relating to Mining and Metallurgy.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications, correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Published Week Ended June 19, 1906.

823,560. ART OF METALLURGY.—Enrique A. Touceda, Albany, N. Y. Filed Jan. 28, 1905.

823,561. METALLURGICAL APPARATUS.—Enrique A. Touceda, Albany, N. Y. Original application filed Jan. 28, 1905.

823,576. PROCESS OF EXTRACTING METALS FROM THEIR ORES.—Craig R. Arnold, Philadelphia, Pa. Filed Dec. 30, 1903.

823,577. MERCURIAL AMALGAMATOR.—Barlow Baldwin, Chicago, Ill., assignor, by direct and mesne assignments, of fourtenths to Erwald S. Hinton and two-tenths to George A. Hamlin, Chicago, Ill. Filed Dec. 4, 1903.

823,650. APPARATUS FOR THE ELECTROLYSIS OF WATER.—Karl J. Vareille, Levallois-Perret, France. Filed Nov. 15, 1905.

823,669. TILTING FURNACE.—John C. Cromwell, Cleveland, Ohio, assignor to The Garrett-Cromwell Engineering Company, Cleveland, Ohio, a Corporation of Ohio. Filed Apr. 9, 1906.

823,703. APPARATUS FOR COMPRESSING SCRAP METAL.—Trevelyan Sharp, Manchester, England. Filed March 30, 1903.

823,749. METHOD OF SIMULTANEOUSLY MINING AND WASHING CLAY, KAOLIN, ETC.—Martin Wanner, New York, N. Y., assignor of one-half to Thomas Skelton Harrson, Philadelphia, Pa. Filed March 28, 1905.

823,896. PROCESS FOR THE MANUFACTURE of SULPHIDE OF ZINC.—Georges Ranson, Brussels, Belgium, assignor to Eugene Marlier, Brussels, Belgium. Filed April 27, 1904.

823,960. MINING APPARATUS.—Alexander McDougall, Duluth, Minn. Filed Jan. 31, 1905.

823,961. MINING APPARATUS.—Alexander McDougall, Duluth, Minn. Filed Oct. 6, 1905.

823,977. MOLD FOR CASTING ANODE-PLATES.—Richard Truswell, Trail, Canada. Filed Oct. 9, 1905.

823,980. ROCK-DRILLING MACHINE.—Cassius M. Walker, Pueblo, Colo., assignor to The Walker-Moore Rock Drill Manufacturing and Supply Company, Pueblo, Colo., a Corporation of Colorado. Filed Nov. 28, 1904.

Published Week Ended June 12, 1906.

822,906. DRILL-SHARPENER.—Clarence W. Atkinson, Jamestown, Colo. Filed Aug. 29, 1905.

822,912. CONCENTRATOR.—Martin P. Boss, San Francisco, Cal. Filed Jan. 12, 1905.

822,913. CRUSHING-MILL.—Martin P. Boss, San Francisco, Cal. Filed Feb. 23, 1905.

822,929. NODULIZING ORES, ETC.—Carl Dellwik, London, England, assignor to J. Edward Goldschmid, Frankfort-on-the-Main, Germany. Filed March 22, 1906.

822,930. CASING-HEAD FOR OIL-WELLS.—Joshua R. Eddy and Richard F. Hadley, Slicker, W. Va., assignors of one-third to said Eddy, one-half to Perley S. Smith, and one-sixth to Harriet E. Smith, Slicker, W. Va. Filed Feb. 16, 1906.

822,935. EXCAVATOR.—James G. Fairbanks and George L. Sauer, Marion, Ohio. Filed Nov. 6, 1905.

822,940 APPARATUS FOR RECOVERING PRECIOUS METALS.—Edward J. Garvin, Portland, Oreg., assignor to The Garvin Cyanide Extraction Company, Portland, Oreg., a Corporation. Filed Jan. 15, 1906.

823,011. BRICK FOR CHIMNEYS.—Rudolf P. Weber, Brooklyn, N. Y. Filed Nov. 14, 1905.

823,057. METALLURGICAL FURNACE.—Bernard C. Lauth, Pittsburg, Pa. Filed June 22, 1905.

823,059. ROCK-DRILL.—Edward Leichter, Nevada City, Cal., assignor of one-fourth to John Bender, Hamilton, Ohio, and one-fourth to J. C. Campbell, Nevada City, Cal. Filed May 20, 1905.

823,097. APPARATUS FOR MAKING WHITE LEAD.—John W. Bailey, New York, N. Y., asignor, by mesne assignments, to United Lead Company, a Corporation of New Jersey. Filed Sept. 13, 1902.

823,234; 823,235; 823,301; 823,302, and 823,303. MAGNETIC ORE-SEPARATOR. Henry H. Wait, Chicago, Ill., assignor to International Separator Company, Chicago, Ill., a Corporation of New Jersey. Filed March 20, 1905.

823,263. BRIQUETTE-PRESS.—James J. Crawford, Oakland, Cal., assignor by direct and mesne assignments, to Eureka Briquette Company, Oakland, Cal., a Corporation of California. Filed Nov. 1, 1905.

823,351. STONE-QUARRYING MACHINE.—Emerson T. Morris, Derwent, Ohio, assignor of one-half to Geo. H. Morris, Derwent, Ohio. Filed March 8, 1905.

823,365. GRINDING-MILL.—Harry C. Robinson, Muncy, Pa. Filed March 17, 1903.

823,393. ROASTING-FURNACE.—Arthur W. Chase, New York, N. Y. Filed July 1, 1903.

823,400. PLATE COOLING AND CONVEYING APPARATUS.—Linden E. Edgar, Philadelphia, Pa., assignor to The Link Belt Engineering Company, Philadelphia, Pa., a Corporation of Pennsylvania. Filed Jan. 18,1904.

823,472. PROCESS OF MAKING SULPHURIC ANHYDRIDE.—Rudolf Knietsch, Ludwigshafen-on-the-Rhine, Germany, assignor, by mesne assignments, to General Chemical Company, a Corporation of New York. Original application filed Aug. 6, 1898.

823,492. MAGNETIC SEPARATOR.—Lewis A. Dunham, Kansas City, Mo., assignor, by mesne assignments, to International Separator Company, Chicago, Ill., a Corporation of New Jersey. Filed Dec. 8, 1902.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

Published Week Ended June 2, 1906.

9007 of 1905. AGGLOMERATING ROASTED ORES—D. Baker and W. W. Hearne, Wayne, Pa., U. S. A. A method of agglomerating spent pyrites and other fine iron ores, by heating to a temperature sufficient to fuse the ores.

14,574 of 1905. SMELTING FURNACE.—C. G. P. de Laval, Stockholm, Sweden. A furnace for smelting fine iron ores, in which the charge (consisting of ores, slag-forming materials and carbon) is sprayed into the chamber in a whirling spiral, and comes in contact with other currents of gases.

16,931 of 1905. ARSENIC RECOVERY.—United Akali Company, Liverpool. Improved methods of removing arsenic from sulphuric acid by means of hydrochloric acid, and recovering the arsenic as arsenious acid.

19,913 of 1905. COAL WASHER.—W. S. Ayres, Hazelton, Pa., U. S. A. Improvements in coal washers of the traveling-belt type.

24,655 of 1905. DISINTEGRATING SLAGS. T. Kalinowsky, Biebrich, Germany. In disintegrating slags poor in lime, introducing the slag while molten into closed chambers and sprinkling with water, the steam generated thereby soon becoming of high pressure and superheated.

5251 of 1906. JIG.—O. Sheppard, Bridgend. Improved mechanism for imparting motion to jigging screens.

Published Week Ended June 9, 1906.

9588 of 1905. COKING WASTE COAL.—J. G. Shedlock, Colchester. A process for rendering waste coal suitable for coking, by mixing it with gas tar and preliminarily heating of the mixture.

9877 of 1905. ZINC RETORT.—A. L. J. Queneau, South Bethlehem, Pa., U. S. A. A retort for zinc smelting, the body of which is made as usual of fireclay and sand, and the inner and outer surfaces made of a mixture of fireclay and some inert substance, such as chromite or carborundum.

10,594 of 1905. FORMING SHEET LEAD.—E. A. Claremont and J. Stratton, Manchester. Forming sheet lead by forcing lead through a circular-ring orifice (3 ft. in diameter and a few inches thick) and then cutting longitudinally and rolling to the required thickness.

11,760 of 1905. ORE CRUSHER.—J. C. Wegerif, London. In pan mills for crushing and grinding ores and other material, setting the rollers in such a position that their axes do not pass through the center line of the pan, in this way obtaining a tearing as well as a crushing action.

12,221 of 1905. MAKING HYPOCHLORITES.—G. G. Hepburn and Mather & Platt, Manchester. Improvements in the belt-jar process for electrolytically producing hypochlorites, with the object of making it possible to use the process on a small scale and intermittently.

14,485 of 1905. REGENERATIVE COKE OVENS.—E. Coppee, Brussels. Improvements in regenerative coke ovens, whereby the whole of the ovens are heated simultaneously, and there is no reversing of the currents of gases and air.

14,572 of 1905. FURNACE.—C. G. P. de Laval, Stockholm, Sweden. A system for producing intimate and rapid reactions between powdered materials and gases by introducing the former into chambers in which the currents of gases whirl rapidly.

14,573 of 1905. ZINC REDUCTION.—Soc. Anon. Metallurgique Procedes de Laval, Frankfort, Germany. Reducing zinc from roasted sulphides by injecting the latter, together with carbon finely pulverized, into a whirling atmosphere of carbonic oxide gas.

17,370 and 21,160 of 1905. ROASTING FURNACE.—A. V. Leggo, Ballarat, Australia. An improved design of mechanical roasting furnace, having several superimposed hearths, the object being chiefly to economize fuel and to catch the flue dust.

19,255 of 1905. MINE SAFETY LAMP.—E. A. Hallwood, Morley, Yorkshire. Improvements in miners' safety-lamps, so that the lamps can be opened only by means of a powerful magnet.

20,752 of 1905. DRYING FURNACE—P. Ostertag, Winter Thur, Switzerland. A drying furnace intended chiefly for drying fine coals before briquetting them.

26,170 of 1905. AGGLOMERATING FURNACE.—J. E. Goldschmid, Frankfort, Germany. Improved rotary furnace for balling together fine iron and other ores, operating at a temperature of at least 1000 deg. C.

1180 of 1906. BLAST-FURNACE CHARGER.—W. Kennedy, Pittsburg, Pa. In apparatus for charging blast furnaces, arrangements so that fine and large pieces are evenly distributed throughout the charge.

3122 of 1906. SULPHUR RECOVERY.—Chemische Fabrik Rhenania, Stolberg, Germany. The use of bauxite in a hydrated oxide of iron and aluminum as contact agent in Claus kilns for recovering sulphur from sulphuretted hydrogen.

Personal.

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Percy L. Fearn, of New York, is in Butte, Mon., on professional business.

Chester W. Purington, of Denver, Colo., has been a recent visitor in New York.

Robert T. Hill has returned to New York, after examining mines in Plumas county, California.

Frank R. Ingalsbe is now with the Dominion Coal Company at Glacé Bay, Cape Breton, Novia Scotia.

Charles Janin arrived in New York from England on June 20, and left soon after for San Francisco.

W. A. Prichard has closed his office in London. His address now is at Apartado 1060, Mexico City, Mexico.

Ludwig Vogelstein, of L. Vogelstein & Co., New York, sailed for Europe on June 19, to enjoy a vacation of two months.

Jacob Langeloth, president of the American Metal Company, New York, sailed for Europe on June 21, to spend the summer there.

Charles F. Porter, of Salt Lake City, has been elected a director of the Nevada Gold Butte Mines Company, operating at Gold Butte, Nevada.

C. L. Whittle, of Boston, Mass., has just returned from New Brunswick, where he has been examining iron and copper properties.

Reno Sales has been appointed chief geologist of the Amalgamated Copper Company at Butte, Montana, succeeding Horace V. Winchell.

W. L. Ehrich, late with the San Francisco del Oro mines, Parral, Chihuahua, is now connected with El Plomo mines, at Altar, Sonora, Mexico.

G. R. Yearsley, of Salt Lake City, has gone to Warren, Idaho, to take charge of the properties of the Thunder Mountain Gold Reef Mining Company.

S. Herbert Williams, managing director of the Shawmut Mining Company, operating at Bingham, Utah, has been in that camp on an inspection trip.

C. J. H. Woodbury, of Boston, Mass., was honored at the commencement exercises of Union College, June 12, with the honorary degree of Doctor of Science.

Charles Barr, recently with the Lackawanna Steel Company, has been appointed superintendent of construction at the Ensley steel plant of the Tennessee Coal, Iron and Railroad Company.

R. H. Burrows, of Guanajuato, Mexico, has gone on an extended trip through Chihuahua and Sinaloa, to examine mining properties on the line of the new Kansas City, Mexico and Orient line.

Fred. Greene, formerly on the geological staff of the Amalgamated Copper Company, has been appointed assistant geologist to the Great Northern Railway Company, with office at St. Paul, Minnesota.

Lewis E. Young, who has been professor of mining at the Colorado State School of mines, has recently been added to the executive force of the Business Men's Clearing House in Denver, Colorado.

N. B. Roper, formerly chief engineer for the Cananea Consolidated Copper Company, Cananea, Mexico, has recently been engaged by the Power and Mining Machinery Company, Milwaukee, Wis., as mining engineer. His headquarters will be at the New York office.

Among the passengers leaving New York for Liverpool, June 19 was President W. H. Whiteside, of the Allis-Chalmers Company, who, accompanied by his wife and daughter, will devote several weeks to a recreation trip in England, Germany, Switzerland and France.

J. V. N. Dorr, manager of the cyanide mill of Lundberg, Dorr & Wilson, Terry, S. D., was in Denver, Colo., recently in the interests of the Horseshoe Mining Company, for which he is consulting engineer in the reconstruction of the cyanide mill at Pluma, South Dakota.

M. Otagawa, assistant general manager of the Furukawa Mining Company of Japan, who has been for some time past in the United States and Europe in the interest of his company, arrived in New York from London, June 23. He left immediately for Seattle and will sail from that port July 2, on his return to Japan.

A. B. Cameron, late foreman of mine No. 3 of the Rock Island Coal Company, at Gowen, Ind. Ter., has been appointed superintendent of the Edwards Coal Company, at Edwards, Ind. Ter. He is one of a coal-mining family. His brother, James Cameron, is president of the Creek Coal and Mining Company, at Henryetta, Ind. Ter.; another brother, John Cameron, is chief engineer of the Western Coal and Mining Company, with offices at St. Louis, Mo.; while the father of the three, William Cameron, is United States mine inspector for the Indian Territory.

H. Kenyon Burch, who has been employed, during the past three years, as mechanical engineer, by the Detroit Copper Mining Company of Morenci, Arizona, where he recently completed the designing and erecting of a new 1200-ton concentrator, has resigned his position to accept that of chief engineer in charge of construction, with the Moctezuma Copper Company of Nacozari, Sonora, Mexico, where a plant of similar capacity to the one at Morenci will be erected. Before taking up the work at Nacozari Mr. Burch will take an extended trip through the North and West for the purpose of inspecting concentration and power plants.

Obituary.

G. B. Manson, late superintendent of the Rincon Mines Company, died of strangulation of the bowels on the evening of June 17, at the company's camp near Congress Junction, Yavapai county, Arizona. Mr. Manson was a man of brilliant attainments, a graduate of the Massachusetts Institute of Technology, and had had considerable practical experience in active mining operations in Colorado and in Arizona. In his death the mining world and the Rincon mines lose a man of splendid attainments who gave every promise of becoming one of the foremost mining engineers of the country.

George James Snelus died at his residence, Ennerdale Hall, Cumberland, England, June 20. He was born in 1837, in London, and educated at St. John's College, Battersea, where he acted for some time as a teacher. Later he attended Owens College, in Manchester, where in open competition he won a scholarship for three years in the Royal School of Mines. There he gained honors, medals, and scholarships of all kinds, and his proficiency won him the appointment of chief chemist in the great Dowlais Works. In 1871 he was made a member of the commission sent to the United States to investigate and report on the Danks rotatory puddling process. His observations in this country led him to the discovery of the basic converter method of making steel, afterward worked out by Thomas and Gilchrist. At the Paris Exhibition of 1878 Mr. Snelus won a gold medal for his elaborate specimens illustrating steel manufacture in different countries. He was an original member of the Iron and Steel Institute and contributed a great number of papers on the subject of iron and steel manufacture to its proceedings. All these papers were regarded as standard authority on the questions discussed. For years before his death he was vice-president of the institute. He had been a fellow of the Royal Society since 1887. Mr. Snelus was an enthusiastic volunteer and an expert rifle shot.

Benjamin S. Treweek, well known as one of the most progressive and successful of the younger mining engineers, died suddenly on June 12, in New Orleans, after a short illness. Mr. Treweek was but 28 years old. He was a graduate of the South Dakota School of Mines, (about five years ago), having had much practical experience even prior to his work as a student at that institution. He came naturally by his taste for and success in mining, for his father was one of the original standbys at the

Homestake, and the son was connected with the mine at various times. In his short career Mr. Treweek occupied several prominent positions, his recent work being largely performed in northern Nicaragua, Central America, a comparatively unknown region. In this rough and inaccessible country, he was superintendent of the Siempre Viva (from 1902 to 1904), which he left to take charge of the Lone Star in the same district. The real building up of the mine, including the difficult but successful installation of a large cyanide plant, was largely the work of Mr. Treweek; indeed he was on a leave of absence from the Lone Star, when he was suddenly stricken down. The death of Mr. Treweek comes not only as a sad blow to his wife and friends but as a distinct loss to the mining fraternity.

Resourceful, straightforward, big in body and mind, he was a loyal friend and many a camp will be saddened at the news that this tried comrade "has gone over the range."

Young as he was he enjoyed to a high degree the confidence of the older members of the profession and his future was full of promise.

Societies and Technical Schools.

Worcester Polytechnic Institute—George I. Rockwood has been appointed professor of steam engineering in this institute at Worcester, Mass. He is a graduate of the class of 1888, and is considered an authority in his special field.

Chicago School of Assaying—This school, conducted by J. Dunraven Young, is now offering instruction in assaying by correspondence courses to miners and others.

University of Utah—At this institution in Salt Lake City, a separate building 104 x62 ft. has been recently erected to be used exclusively for work in metallurgy, including milling and assaying. The north half of this building is occupied by the milling and smelting machinery and appliances. The south half includes a laboratory with desks for wet assaying and metallurgical analysis, two furnace rooms for fire assaying, a balance room, a dispensary and store room, a photographic dark room, a drawing room, a class room and two office rooms. The metallurgical laboratory is designed for practical use by the students in carrying out milling and smelting tests on commercial ores, and it serves to illustrate lecture instruction on the principles underlying the mechanical and chemical treatment of ores. Each machine is so arranged that it can be worked alone or in connection with others, or the whole concentrating mill may be operated in either one or two independent units. Care has been taken everywhere that no pockets are formed where the ore may be lodged to interfere with subsequent tests. The milling machinery includes the concentrating plant shown at the St. Louis and Portland expositions by the State of Utah. The smelting equipment includes roasting, reverberatory and blast furnaces, an electric furnace, and all necessary tools and instruments. The assay laboratories are fully equipped. These labratories are not only used for the regular course in assaying, but furnish means of testing and checking the work of the milling and metallurgical laboratories. The department is in charge of Professors Robert H. Bradford and Gustave A. Overstrom.

Industrial.

The Galena Iron Works, at Platteville, Wis., has just completed the installation of the jig plant at the coke mill in Livingston camp.

Calvin Essex, New Straitsville, Ohio, has been appointed one of a committee to investigate the various rock-drills, and decide on a type suitable to use in their gold and copper mines at Night Hawk, Washington.

The Stephens-Adamson Manufacturing Company, Aurora, Ill., sums up its system of conveying in a bulletin entitled "Power and Transmission," which contains a great deal of useful information about conveyors. There are some serviceable tables, including one giving weights of cast-iron pulleys, which it is not easy to find elsewhere.

The Weston Electrical Instrument Company, Weverly Park, Newark, N. J. has this year taken Caxton Brown into the Newark factory, as secretary of the company and sales-manager; and in his place, have put Stanley Brown as manager of the New York office. In connection with this office, there has been installed a repair department, the duty of which is to take care of the repairs in the metropolitan district, and particularly to look after emergency calls.

The Abner Doble Company has re-located its office at the former site, Fremont and Howard streets, San Francisco. The company is one of the first to resume operations in the burned district, and has taken contracts for a large amount of work in addition to the orders on hand previous to the fire. Work is progressing rapidly on the company's new shops and warehouses in the Potrero district. Temporary pattern and forge shops are already in operation on the new site.

The Traylor Engineering Company has recently received orders for two blast furnaces from clients in the Northwest. The size of these furnaces is 46x255 in. They are to be equipped with the Giroux hot blast top. The company has an order for two other furnaces for British Columbia, 46x204 in., and another order for two furnaces for a Mexican company, each 42x 160 in., and another for a New Jersey copper refinery 42x60 in. Samuel W. Traylor, president, has just returned to New York after an extended trip to Mexico. One of the results of the trip was the conclusion of negotiations by which the firm of Victor M. Braschi & Co., of the City of Mexico, has taken an exclusive agency for the products of the Traylor Engineering Company in Mexico.

The Power and Mining Machinery Company, Milwaukee, Wis., has recently booked an order for 12 sets of 36x15-in. crushing rolls and two sets of 54x20-in. crushing rolls, for the Utah Copper Company, near Garfield, Utah. While the 54x20-in. rolls will be the largest of their kind ever built, the 36x15-in. rolls will be very powerful crushing rolls. These rolls constitute an advance order for one of four units of crushing rolls to be installed in the above plant. The rolls are now being built in accordance with designs made by Mr. Bradley. They will be extra heavy throughout, and are designed for a spring pressure that will practically make them a rigid roll. They will be carefully housed, and special attention will be paid to lubrication. Removable liners will protect all parts coming in contact with the ore. Included with the above order for rolls was also an order for 6-ft. special, extra heavy Huntington mills for the regrinding of middlings from the jigs.

The permanent steel structure manufactured and erected by Heyl & Patterson, Inc., of Pittsburg, Pa., at the Crow's Nest Pass Coal Company's Coal Creek colliery in Southeast Kootenay, British Columbia, is now stated to be giving satisfaction, with the machinery running smoothly. The trestle is 832 ft. in length, crossing from one side of Coal creek valley to the other and connecting with mines on both sides. The equipment consists of modern coal-handling machinery and appliances, all selected with a view to labor-saving and expedition in handling coal. Present provision is for handling up to 4000 tons per diem, but the structure has been designed with a view to an eventual extension to 8000 tons. Electric locomotives, trip and auxiliary feeders, rotary dumps, and kick-backs handle the loaded and return cars; shaking tables, belt conveyors, and picking tables provide for the screening and dry cleaning of the coal; and a gravity box-car loader delivers it into cars ready for shipment.

Trade Catalogs.

Receipt is acknowledged of the following trade catalogs and circulars:

Cyclone Drilling Machine Company, Orville, Ohio. Catalog, Prospecting Machinery. Pp. 80, illustrated; paper, 6x9 in.

Electro-Dynamic Company, 11 Pine St., New York City. Circular No. 22, The Inter-Pole. Pp. 2, illustrated; paper, 6x9 in.

Electro-Dynamic Company, 11 Pine St., New York City. Circular No. 23, Inter-Pole Motor. Pp. 8, illustrated; paper, 6x10 in. 1906.

D. T. Williams Valve Company, Cincinnati, Ohio. Pamphlet, "Williams" Regrinding Valves. Pp. 10, illustrated; paper, 4x7 in. 1906.

Nichols Copper Company, 25 Broad St., New York City. Pamphlet. The Herreshoff Roasting Furnace. Pp. 6, illustrated; paper, 4x6 in.

Redwood Manufacturers' Company, 8 California St., San Francisco, Cal. Catalog. Wooden Stave Pipe. Pp. 84, illustrated; paper, 4x6 in. 1904.

J. Geo. Leyner Engineering Works Company, Denver, Colo. Catalog No. 8, Leyner Rock Terrier Drill. Pp. 31, illustrated; paper, 7x9 in. 1906.

Columbia Engineering Works, Tenth and Johnson Sts., Portland, Ore. Bulletin S-I, Steel Casings. Pp. 23, illustrated; paper, 6x9 in., Jan., 1906.

The Ingersoll-Sergeant Drill Company, 26 Cortlandt St., New York City. Catalog, The Blue Book of Air Compressors. Pp. 31, illustrated; paper, 5x7 in.

De La Vergne Machine Company, East 138th St., New York City. Catalog, The Koerting Two-Cycle Double-Acting Gas Engine. Pp. 10, illustrated; paper, 4x9 in.

Davidson & Company, Ltd., "Sirocco" Engineering Works, Belfast. Catalog No. 331. "Sirocco" Fans for Mine Ventilation. Pp. 19, illustrated; paper, 6x7 in. Mar., 1905.

Allis-Chalmers Company, Milwaukee, Wis. Bulletin No. 1201-A, Tamiz Universal Perfeccionado de Movimiento Oscilatorio. Pp. 11, illustrated; paper, 8x11 in. Enero, 1906.

Stanley-G. I. Electric Manufacturing Company, Pittsfield, Mass. Bulletin No. 601, High-Grade Direct Current Motors and Generators. Pp. 32, illustrated; paper, 6x9 in. February, 1906.

A. S. Aloe Company, 513 Olive St., St. Louis, Mo. Catalog, Mathematical and Engineering Instruments & Drawing Materials. Pp. 272, illustrated; indexed; cloth, 7x10 in. Twentieth edition.

Construction News.

Rewey, Wisconsin—A hoisting and pumping plant and a gasoline engine are to be installed at the Coker mine. Spensley & McIlhon, Platteville, Wis., are owners.

Mount Wilson, Colorado—The Gold Development Company expects to add 10 stamps to its mill, and will need other machinery. E. L. Davis, Telluride, Colo., is local manager.

Etzatlan, Jalisco, Mexico—The Amparo Mining Company is having plans prepared for a mill at the Santo Dominguez mine. An 80-stamp mill, concentrators and a cyanide plant are proposed. Paul Clever, Etzatlan, is engineer.

Morgan, Utah—The Carbonate Hill Mining Company proposes to install an air-compressor, drills and an aërial tramway. M. A Daugherty, Salt Lake City, Utah, is general manager.

Telluride, Colorado—The Black Bear Mining Company expects to put in a 10-stamp mill, concentrating plant and a wire-rope tramway. Leonard Kaanta, Telluride, is president.

Bear Creek, Colorado—Additional machinery will soon be needed for the Mammoth & Buckhorn group of mines. M. A. Wood and Adolph Helin, Telluride, Colo., are owners.

Grass Valley, California—The New York-Grass Valley Mining Company, is arranging to put in a cyanide plant on ground adjoining its present mill. The address is Grass Valley, California.

Wilder, Fentress County, Tennessee—The Fentress Coal Company is preparing to open new mines and double its present output. Hoisting engines, a tipple, pumps and other machinery will be needed. W. J. Nixon, Chattanooga, Tenn., is manager.

Fort Dodge, Iowa—The Hawkeye Plaster Company and the Iowa Hard Plaster Company are preparing to mine gypsum and make plaster, and will need grinding mills and other machinery. J. J. Ryan, Fort Dodge, is head of the Hawkeye, and C. F. Duncombe, Fort Dodge, of the Iowa Company.

Platteville, Wisconsin—The Beacon Light Mining Company is in the market for a hoist, air-compressor and drills. Address at Platteville.

The Hawley Mining Company, of Platteville, is figuring on a complete power and compressor plant, of the highest type obtainable. It is the intention to install an 80-h.p. boiler, seven-drill compressor, steam hoist, pump, etc. Address at Platteville.

Nelson, British Columbia—The concentrating mill at the mine of La Plata Mines Company, Ltd., at Kokanee creek, Nelson mining division of West Kootenay, which was started on May 23 has since been working satisfactorily, the machinery running smoothly and the plant exceeding its guaranteed capacity of 75 tons per diem. The crushing plant consists of a Blake crusher, two sets of 36x 14-in. rolls, and, for fine crushing, a 5-stamp battery. The concentrating machinery includes jigs of from two to five compartments, Overstrom tables, six Frue vanners, etc. Two products are being made—zinc and silver-lead concentrates. The latter are shipped to the Hall Mining and Smelting Company at Nelson. It is intended to shortly install an air compressor and electric light plant at La Plata mine, which was long known in the district as the Molly Gibson.

Special Correspondence.

San Francisco. June 20.

The new shaft of the Kennedy Mining and Milling Company at Jackson, Amador county, is now down to a vertical depth of 3060 ft., and when another 40 ft. is reached, drifting will commence on the 3000 level. The shaft is to be continued down to 4000 ft. vertical without intermission of work. The machinery installed is intended for even greater depth. Very good ore indeed is now coming out of the 1850 level, where specially rich ore was recently found. The success of this famous producer at such depths on the Mother Lode is an incentive for other mines on the lode to continue their shafts further down, and most of them intend doing so.

The extensive water rights, ditches, lakes, reservoirs and water sheds of the Eureka Lake and Water Company in Nevada county have been sold to E. J. McCutcheon, of San Francisco, who is believed to be acting for W. B. Bourn, of the Empire mines, Grass Valley. The amount of money involved is said to be in the neighborhood of a million. George W. Starr, who is interested with Mr. McCutcheon and W. B. Bourn in the Gaston mine, will be manager of the new water supply. If the water supply of the Eureka Lake Company is added to the present holdings of Mr. Bourn and others it will make a large property, and the owners will be in a position to compete with the Bay Counties Company, which recently purchased the South Yuba Company's water rights. It is believed that in time there will be an effort made to furnish San Francisco and other cities about the Bay and in the interior of the State with a supply of pure water. Included in the deal are such large bodies of water as French lake, Weaver lake, McMurray and others, in addition to Eureka lake itself. With the water supply go valuable gravel properties in the county, including some which were famous years ago. Many square miles of land are embraced in the mining holdings. The catchment area of the Bloomfield and the Milton properties is 68 square miles, in which are 11 main reservoirs, varying in area from 10 to 487 acres. The total area of the reservoirs of these companies is over 11,600 acres, with a total capacity of over 2,195,000,000 cu.ft. The Bloomfield reservoirs and ditch plant cost $708,841. It has 157 miles of ditches and reservoirs.

The Mammoth Copper Company, at Kennett, Shasta county, has made an important change in the matter of the big water supply necessary for the smelter. Heretofore two centrifugal pumps, each of 500 gal. capacity per minute, and each operated by a 25-h.p. electric motor, have raised the water from Backbone creek, a vertical distance of 150 ft. From now on, water will be taken along just over the

smelter. The Butters water system is now almost complete.

Owing to the later and frequent rains this summer, freighting for the higher mountain towns in this State did not commence until the middle of this month. The supplies of a number of merchants in these places have run out and teams have now commenced hauling, about a month later than usual. Sierra and Plumas county mining regions in the higher altitudes have been short of supplies.

The Feather River Exploration Company has acquired the title, the dredge and realty owned by the Cherokee Gold Dredging Company. The deed made by the latter company was to W. P. Lynch, who conveyed his interest to W. P. Hammon, the latter in turn deeding to the Feather River Exploration Company, Consolidated. The deed conveyed all the Cherokee Company's property in Butte county—a dredger and about 400 acres of land.

The Draper mine in Tuolumne county has been sold at sheriff's sale and was bought in by E. J. & C. E. Cotton, of Oakland for $30,254, the amount of their judgment and costs. Miners' wages and other claims against the property, aggregating about $20,000, remain unsettled, and there appears to be no means of satisfying them.

The new furnace at the Great Western Copper Company's smelter at Ingot, Shasta county, has been blown in and is treating about 200 tons a day. The capacity of the plant is doubled by the operation of the new furnace, and the output will be still more increased as soon as the zinc can be successfully handled. At the mine sinking has now commenced from No. 4, or lowest level, through solid ore. The railroad is being extended from the Cooper Hill to the Afterthought proper and explorations will be commenced in that claim at once.

A company of wealthy men is carrying on prospecting operations for copper at Iron Mountain, west of Grass Valley, Nevada county, and has connected a 700-ft. tunnel with the shaft for a drain. The pumping plant will now be placed at the end of the tunnel. The same people have bonds on all the more promising copper claims in that part of the county, with a view to developing them on a large scale when the California Midland Railroad is in operation, as it passes through that section.

The strike of the slate quarrymen at Slatington, El Dorado county, has been settled by the slate workers accepting $3.25 per day, as offered by the company, and resuming work. It is a compromise, the men having received $3 per day before the strike and having demanded $3.50 per day.

The Sultana Gold Mining Company has purchased the 20-stamp mill and milling plant of the Allison Ranch Gold Mining Company. With the purchase go the concentrators, three big compressors, the buildings and all the splendid equipment of this mine. The mill and buildings will be immediately dismantled and taken to the Prescott Hill, the central property of the Sultana group. There are already 15 stamps at the Sultana mine, Grass Valley, and arrangements are being made for 20 more in addition to those of the Allison Ranch Company. This should put the Sultana to the front as one of the big mines of Grass Valley. All the mines in the holdings of this company were idle a few years ago, having been overlooked, though surrounding them were many mines which were producing at good depth.

The Southern Pacific Railroad will, after July 1, reduce the mileage rate in the State of Nevada 20 per cent. This will mean that 4c. per mile will be charged on all lines of the company in Nevada after that date, as against a prevailing schedule of 5c. It is understood that this reduction has been contemplated for some time; in fact, ever since Nevada began its era of phenomenal prosperity two years ago.

Butte. June 22.

With the exception of the Pittsburg & Montana Copper and La France, all of the large mining companies operating in Butte have filed in the office of the county assessor as required by law sworn statements showing gross earnings, expenditures, etc., for the year ending June 1. One interesting feature of the reports deals with the operations of United Copper, which worked the property now owned by Red Metal during the first eight months of the year, while Red Metal operated it the other four. While United Copper worked, its total output of ore a month aggregated 34,290 tons, while Red Metal produced from the same mines 37,275 tons a month. The average net earning of United Copper per month for the eight months was $74,238; that of Red Metal for four months, $110,325. The gross yield of United Copper ore was $8.83 per ton; that of Red Metal from the same mines, $12.94. The extraction of ore cost United Copper $4.38 per ton; Red Metal, $3.94. In transportation and reduction United Copper led. It mined in the eight months 274,322 tons of ore, paid $69,129 for transportation and $2.04 per ton for reduction, while Red Metal mined 149,101 tons, paid $89,460 for transportation and $3.94 per ton for reduction.

Original Consolidated, (Clark) mined during the year 316,466 tons of ore, an average of 867 tons a day, the gross yield of which was $8.61 per ton and the cost of mining $3.47. The cost of reduction was $2.90 per ton, and the total cost of transportation, $63,153. Net proceeds, $647,624.

Exclusive of the Pittsburg, La France, East Butte, Raven and smaller companies and lessees of mines, the total output of ore by 11 companies operating in Butte during the 12 months aggregated 4,408,627 tons, an average of 12,078½ tons a day for the 365 days. This output was divided as follows: Anaconda, 1,521,310; Boston & Montana, 1,209,805; Butte & Boston, 246,593; Washoe, 95,210; Parrot, 163,569; Trenton, 168,770; North Butte, 259,650; Red Metal (four months) 149,101; United Copper (eight months) 274,322; Original, 316,466; Alice, 3831. North Butte showed a gross yield of $21.11 per ton; Boston & Montana, $12.82; Anaconda, $10.92; Butte & Boston, $11.44; Washoe, $12.05; Parrot, $8.54; Trenton, $9.54; Red Metal, $12.94; United Copper, $8.83; Original, $8.61, and Alice $8.23. The latter property was operated at a loss of $5,871.07, but it is not copper.

The net proceeds of the work were as follows:

	1905.	1906.
Boston and Montana	$5,855 620	$6,158,110
Anaconda	2,259,694	5,763,265
Butte and Boston	178,713	1,075,893
Parrot	328,107	277,015
Trenton	70,110	541,529
Red Metal	.....	441,299
United Copper	606,953	593,907
Original	349,387	647,624
North Butte	291,385	1,848,009
Totals	$9,939,696	$17,336,651
Increase for 1906		7,398,682

North Butte and Red Metal are preparing to increase their production considerably, the former about 700 tons a day and the latter from 500 to 700. Anaconda and Parrot are also in line for greater output, the former having begun operations in the Pacific and Poulin through the Buffalo shaft and the latter having begun sinking the main shaft on its Parrot and 600-ft. shaft on the Little Mina with a view of placing that property in the producing class.

Denver. June 23.

During the past week, Denver had a very interesting visit from a company of more than 80 capitalists from the East, who arrived in a special train and paid a visit to the Gilpin county gold mines. It is probable that before many days, the visit will result in a large deal in mining property in that district, which for the past 40 years has been a steady producer of the precious metals, especially gold.

From reliable sources it can be stated that the American Smelting and Refining Company will at once commence to enlarge its zinc plant at Pueblo; the capacity will be more than doubled.

News was received here this week of the death of William A. Akers, who was prominent in mining circles here for many years, the result of injuries received in an automobile accident at Los Angeles.

Governor McDonald has appointed B. A. Langridge, one of the best known mining engineers in this State, as State geologist.

Within a few days the large Green

Mountain mill, near Silverton, which was badly damaged by a snowslide last winter, will be started again. A large amount of the latest machinery has been added.

Articles of incorporation of the Omaha & Denver Short Line Railroad have just been filed, the capital stock being placed at $12,500,000. It is the intention of the incorporators to build a new line from the Missouri river to this city.

A. J. Murray has brought suit against the Colorado Fuel and Iron Company for $25,000 damage to his land, part of which is occupied by the company for the canal, which they are constructing from Adobe on the Arkansas river to Pueblo.

Advices received from Cananea, Mexico, within the past few days, state that a number of members of the Western Federation of Miners are leaving there for United States territory, having been warned that wholesale arrests may take place.

A telegram received from El Paso, Texas, states that the Buena Tierra mine at Santa Eulalia, Mexico, is on fire and 13 miners perished.

Cripple Creek. June 22.

The shaft on the Burns claim of the Acacia Company has now attained the depth of 800 ft., and the mine has been closed down for repairs preparatory to drifting. It is expected to cut the extension of the ore shoot on the Shurtloff of the Findley Company. Whether this has been cut is the question that is agitating the buyers of mining stock. The day after the shaft was completed the stock of the company advanced very materially.

Work is being pushed on the Wish Bone mill on Mineral hill and it is understood that it will soon be ready for operation. The mill on Copper Mountain will also undergo some repairs before long, it is understood. The Forest Queen mine, on Ironclad hill, is at present closed down, awaiting the letting of a new lease on the property.

Mineral hill is attracting a good deal of attention just now. Mr. Perault, who has done a large amount of work on this hill in the past, is again operating on the First Chance property. A hoisting plant has recently been installed and a contract for 50 ft. of drifting has been let. Hollingshead and associates are also doing considerable work in the vicinity and have very good looking prospects.

It is reported that the Isabella Company will soon erect a mill on its property on Bull hill. The production from the Isabella on Bull hill is greater at present than for some time past. Most of the ore is being produced by lessees. The small mill on the Homestake property is running regularly as is the one on Santa Rita, near Victor.

Battle Mountain is shipping a large amount of ore at the present time. The principal shippers on this hill are the Portland, the Stratton's Independence, Strong, Ajax, Ophir and Monument. The Portland is shipping in the neighborhood of 10,000 tons per month.

It is probable that the tonnage of the district is as great as it ever has been in the history of the camp.

Leadville. June 22.

There is a little excitement over the discovery of some rich float that has been found in East Tennessee gulch within the last two weeks. Two months ago notice was taken in the columns of the JOURNAL of five-ounce gold ore that was being taken out of the Jennie June claim in this section; this, together with the rich float, has started a boom in the section. The territory is located about 1½ miles from Tennessee Pass tunnel on the Rio Grande railroad. It is by no means a new section since, as far back as 1863, the placer miners of California gulch worked the different gulches and failed to make them pay. The district was again revived for veins in 1878, and since that date there have been five excitements. The formation is similar to that of Leadville, being a succession of limes and quartzites, with porphyry dikes and sheets. The quartzites, especially the Cambrian, are unusually prominent, the latter being readily traceable from the famous gorge point below the junction of Big Evans with the Arkansas river, straight north to the East Tennessee section. The veins are fissures, so far as opened, cutting down vertically through porphyry and sedimentary sheets. The dividing ridge between Thayer and East Tennessee gulches, and Gold hill on the east side of the latter, are liberally sprinkled over with rich float. The geologists, Hayden and Emmons, are credited with expressing themselves favorably on the geological conditions existing here for ore discoveries. The claims at present being worked are the Jennie June, Helen Gould group, Golden Gate, Lucy L. and Gold Hill placer.

The old Climax mine, Fryer hill, is again being worked, this time by Leadville men. The new company sunk a shaft on three acres of ground that had never been worked and when it reached a depth of 135 ft., it entered upon a body of iron that is 35 ft. thick and which runs 12½ oz. silver per ton and 53 excess iron. Underneath the iron a carbonate contact is exposed, and after a station is cut below the iron body and the ground opened up to permit of shipping, the shaft will be sunk beneath this contact and thoroughly explored.

A number of New Hampshire capitalists have taken hold of the ground belonging to the Summit Mining Company, New Robinson Mining Company, Belmont group and the Pan-American claim, consisting of 21 claims and comprising 110 acres of ground. The company is organized under the laws of South Dakota and is known as the International Mining Company. H. M. Shepherd, a Leadville miner, is the local manager. The Robinson ore shoot has been opened for 2000 ft. without a break, except that it splits into two parallel shoots which are respectively 110 and 81 ft. wide at the present head, 400 ft. within the ground now controlled by the International Company, with an average thickness of 5 ft. The ore is a clean sulphide carrying gold, silver, lead and 25 to 35 per cent. iron excess. The company has started a new shaft on the Eldorado ground and will send it down 1000 ft. As the water is light in the district, rapid progress will be made in sinking.

The old Grand Trunk group of claims, Holy Cross district, will be worked extensively this summer. A new company, known as the French Mountain Mining and Milling Company, has taken hold of the proposition, and has the necessary means to carry the enterprise to a successful issue. The main or lower tunnel on the Grand Trunk is in 2600 ft. and will be driven another 400 ft. before the desired point is reached. The vein is about 2 ft. wide, with several rich streaks of gold ore running through it; this is sorted and shipped in the crude state. The balance will be run through a cyanide mill which is located at the foot of the dump, with a capacity of 120 tons daily. J. W. Bailey, of New York, is the resident manager.

At the 400-ft. level on the Nevada claim, South Evans, a rich streak of gold ore was followed for several hundred feet but failed to catch the main shoot. The owners are now sinking the shaft deeper, and when the necessary depth is gained, drifting in different directions will be started from the bottom of the shaft.

The New Monarch Mining Company is now shipping in the neighborhood of 2000 tons per month of a good grade of ore. In addition to this, work is being pushed vigorously on the Winnie and Cleve.

Work has been resumed on the Graham gulch shaft, directly behind the Yak assay office. The shaft will be sunk deeper and work will also be conducted in the old workings. When last worked the mine produced a heavy tonnage of lead-carbonate ores, but the water problem was the cause of shutting down.

Salt Lake City. June 22.

The Metal Extraction Company has been formed in Salt Lake to introduce a new ore-dressing device. The incorporators are S. I. Clawson, R. S. Nelson and R. R. Romney, all of Salt Lake.

The Buckhorn mine in Ophir Cañon, Tooele county, has been sold to a local and Eastern syndicate which has organized the Cliff Mining Company. The property adjoins the territory of the Ophir-Hill Mining Company at Ophir, Utah, on the west. The organization of the Cliff consists of A. D. Thompson, of Duluth, Minn., president; Willard F. Snyder, of Salt Lake, vice-president; A. L. Kern, of Duluth, secretary and treasurer. These, with

F. D. Adams and George D. Swift, of Duluth, constitute the Board of Directors. R. M. Atwood, of Helena, Montana, has been made manager. The mine is to be extensively equipped and placed on a producing basis.

During the past week the Uncle Sam Consolidated posted a dividend of $5,000; the Grand Central for $15,000; Victoria for $12,500; all of the Tintic mining district. The directors of the Utah mine, of Fish Springs, increased the regular distribution from $1,000 to $2,000 and also announced an extra of $2,000. The latter company has been receiving about $10,000 monthly from ore sales.

The mine-owners of the Tintic mining district have presented a formal request to the transportation companies entering the district for a lower freight rate on ore shipped to the Salt Lake smelters. The operators want a rate of $1 a ton on ore having a net value of $10 a ton and less; $1.50 on ore above $10 and under $20. The present charges are $1.50 a ton on ore not exceeding $15 a ton net value, while $2.50 is charged for all ore in excess of that figure. The operators declare that Tintic is the only camp of importance where the railroads have not granted such concessions as would enable the profitable mining of low-grade ores, and it is pointed out that Bingham operators get their ore hauled at a rate of from 25 to 30c. per ton where the mileage covered is about one-third.

At the annual meeting of shareholders of the Lucky Bill Mining Company, which owns property adjoining Little Bell, at Park City, Simon Bamberger was elected president; Herman Bamberger, vice-president; J. B. Bean, secretary; these, with A. N. McKay, James H. Moyle, Elias A. Smith and A. D. Pierson, all of Salt Lake, are directors. The company has about $6,000 in its treasury for development purposes.

The management of the Garfield Smelting Company encountered some labor trouble this week when about 200 Greeks quit work. The strikers undertook to intimidate other workmen. The sheriff was called on, the ringleaders to the number of 25 were arrested, and quiet was restored. The men wanted to work an hour less each day and draw the same amount of pay, which the management refused to do, inasmuch as the scale paid was at least 25c. per day more than at any other smelter in the Salt Lake valley.

Quite a number of mining men who have been active in Goldfield and other Nevada camps have been making an inspection of the Deep Creek country lately, and are said to have been favorably impressed. Indications point to a boom in this region before the close of the present year.

The management of the Beck Tunnel Consolidated has raised the wages of miners to $3 per day as the minimum scale.

The Consolidated Jefferson Mining Company's shareholders at their annual meeting elected A. W. Nieman, of Chicago, president. This company is developing a property at the mouth of Little Cottonwood cañon, near Salt Lake City. A drain tunnel is being run and it is now in 1004 ft. It will have to be extended 200 ft. to tap any known orebody.

The Bingham Mines Company has filed articles of incorporation to operate a group of claims near the domains of the Boston Consolidated and United States mines, comprising about 250 acres. The incorporators are: John Dern, president; Charles W. Whitley, vice-president; Frank Knox, treasurer; P. B. Locker, secretary; these, with D. C. Jackling, Samuel Newhouse and H. C. Edwards, comprise the board of directors.

The ore and bullion settlements reported by Salt Lake banks last week aggregated $450,600.

After 30 years of inactivity, the Sunday mine in the American Fork mining district is to be operated again. The property is now owned by Duluth parties. It has quite an enviable producing record.

Elmer E. Jones, for himself and associates, has purchased for $25,000 the Annandale Fraction lode mining claim, in the Tintic mining district.

Joplin, Mo. June 23.

The L. B. Jones land, adjoining the Rex Mining and Smelting Company's lease southeast of Joplin, gives promise of being one of the big producing leases. The U. S. Mining Company, operating on this land, made its initial turn-in last week, amounting to 77,730 lb. of high-grade zinc.

O. W. Sparks and E. J. Murdock, of Galena, Kansas, have secured a lease on 800 acres of virgin land lying west of Galena. They also intend taking up 200 acres more adjoining, giving them in all 1000 acres. They intend to thoroughly prospect the property by doing about 10,000 ft. of drilling, which they have already begun. There has never been a drill-hole put down on any of the land, but the location and lay of the land make it such that the prospect work will be watched with great interest by mining men all over the Missouri-Kansas district. It is situated in the same range with the Badger and Peacock mines, on Spring river.

A large deal was closed June 15, when the Granby Mining and Smelting Company acquired title to about 8000 acres of land in Newton county. The estate purchased embraces 7600 acres, and was conveyed to the Granby Company by the Missouri Land and Live Stock Company and the Billings estate. The land purchased is not in a single body, but is distributed throughout the county, a portion of it being near the large productive mines of the company at Granby. The land will be prospected and developed. The officers of the company decline to make public the amount involved.

Bert W. Lyon, of Joplin, and some Michigan parties, who recently took a lease on 40 acres of the Connor land, west of Prosperity, have just made the twelfth successive drill strike on the 10-acre tract on which their mill is located. The last drilling shows the entire 10 acres to be underlaid with a sheet ore formation between the depths of 180 and 208 ft. In 1900 a company of Kansas City parties spent $40,000 on this same tract of land, but at that time ore was selling at $26 per ton, and as expenses could not be met on that price the mine was abandoned.

What promises to be a big vein of lead has been struck at the Waddell mine, west of Carthage, by a drill which has been prospecting the ground. At a depth of 172 ft. the lead was encountered and the drill continued in it for 25 ft. What makes this of importance is the fact that there has been very little lead produced from any of the mines east of Webb City, running southeast to Duenweg.

Platteville, Wis. June 23.

The Klar-Piquette is the farthest along in point of development of any of the newer propositions; enough progress has been made to warrant the installation of power sufficient to work the mine to a better advantage. The company has called for bids for air compressor, boiler, engine, etc. The contract will probably be let the coming week.

The new 20-ton roaster at the Empire, constructed by the Galena Iron Works Company, was started the latter part of the week. Some new applications in the way of conveying and feeding the ore to the kiln are being tried with satisfactory results.

The Broadway Company, that has been drilling the property adjoining the Empire has developed a good run of ore. A sheet of solid ore was drilled through 4 ft. thick. With the new strike at the Grant County these two drill-holes show that the Empire range continues for at least a mile after it leaves that property.

Several new Star drills of the heaviest type have been shipped into the Platteville camp within the last week, it being the intention to drill deeper than has been the custom herctofore. The average depth has been about 150 ft., but little is known about the lower depths.

Work is progressing satisfactorily on the property of the Pittsburg-Benton. When the main shaft was down to 105 ft. a rich lead of ore was penetrated. A drift was started which is now in some 50 ft. The company has piled out about 100 tons of rich dirt. Drifting will continue until the body is gone through and then it will be crosscut.

Another property that is getting ready for further equipment is the Calumet Lead and Zinc Company, which just purchased a five-drill Ingersoll-Rand air compressor. This property is incorporated under the laws of Wisconsin for $100,000,

and is under the management of an experienced western miner. The shaft is down some 95 ft. The property joins the Midway, managed by Ben Huntington, where they are trying a new style of self-contained pump head that is giving entire satisfaction.

The machinery which has been ordered for the new roaster and concentrating plant at the Black Hawk is beginning to arrive and will be installed immediately. In the meantime the development work is being pushed.

Duluth, Minn. June 23.

Diamond drilling at the old Tilden, Gogebic range, which had been looked on for some years as a "scram," has disclosed at the depth of 1100 ft., and near the west line of the property, a continuance of the Colby ore lense, which will make the mine a large producer once again. This is an important matter for Bessemer and the mines of that vicinity. It is coming to be recognized, more and more fully, that the Gogebic is a great range, and that no one has yet been able to set depth at which its ores will cease to be valuable.

Mine tax values in Iron county, Mich., in which are the mines of Crystal Falls, Iron River, Mansfield, Stambaugh and Hemlock, have been fixed at about the same as last year. Corrigan, McKinney & Company are to pay taxes on a valuation of $380,000, the Oliver Iron Mining Company $300,000, and other companies smaller amounts.

The Oliver Iron Mining Company has an option for $700,000 on the lands of the Cedar River Land Company which cover 60,000 acres in the counties of Dickinson, Delta, Marquette and Menominee, Michigan, and contain hundreds of millions of feet of standing timber and several large sawmills. This will make the company the second holder of land in the Upper Peninsula, and give it a very large amount of timber for its mines. All this land will be immediately withdrawn from the market, so far as timber is concerned.

Pickands, Mather & Co., will sink a new four-compartment shaft at Brotherton mine, add materially to the surface equipment there and at the adjoining Sunday Lake, and increase the production of both. These mines have been explored carefully of late and found to contain a larger deposit of ore than was expected, and both will be larger shippers than under the former regime.

Stripping is under way at the Stephens mine, eastern Mesabi, with three shovels, in anticipation of large business later on. The mine may not ship ore this year, but is able to get out a very large tonnage when desired. The Oliver Company is also carrying on extensive preliminary operations at the Norman, Ohio, Lone Jack and Oliver mines, at Virginia, and evidently expects to make an immense shipper out of that group later on, perhaps not this year. Plans of development there include a vast amount of stripping and a large operation generally.

Calumet, Mich. June 23.

Lake Superior mines produced approximately 20,000,000 lb. of refined copper in May. This is the largest monthly output on record. When the Tamarack and Atlantic production is restored to normal proportions, the output of the district will be even larger than that.

Mohawk broke its former record by turning out 1,202,500 lb. of mineral last month. This mine is now producing at the rate of 11,000,000 lb. of refined copper per annum. The improvement in the lower levels of the northern shafts is marked, and is largely responsible for the better results.

Allouez made more copper last month than in any previous month since it started producing. The present yield is at the rate of 3,000,000 lb. of fine copper per annum. After much delay, caused by the excessive inflow of surface water, sinking has been resumed in the new No. 2 shaft. The opening is down 90 ft., and no further trouble is expected. It will take about two years to place No. 2 shaft in shape for production.

Centennial is now producing more copper than ever before, its yield being at the rate of 2,000,000 lb. yearly. The product is gaining steadily, both in the mineral average and the total yield. As the openings in the shoot of copper encountered in the lower levels are expended, and more rock comes from these openings, the yield should show better results.

A small crew of men is employed in cleaning out and unwatering some of the old openings on Carp Lake property, in the Porcupine Mountain copper range of Ontonagon county. It is planned to conduct some exploratory work. A mass of native copper weighing three tons was uncovered a few days ago. The Carp Lake is in the same section as the Nonesuch, which is being explored by the Calumet & Hecla.

It is remarkable that the production of the Wolverine mine in May was even larger than that of the same month one year ago, notwithstanding that it had only one-half of the mine available for rock shipments. Since the shaft and rock house at No. 3 was burned, operations in No. 4 have been crowded to the limit, and by working three shifts of men eight hours each, the output has not suffered. The new steel shaft and rock house at No. 3 is rapidly nearing completion, and will be ready for service very shortly.

Articles of incorporation of the Caldwell Copper Company, capital stock $2,500,000 in 100,000 shares of $25 each, have been filed under Michigan laws. It is a subsidiary company of the Calumet & Hecla, formed to acquire and develop 560 acres of land between the Tecumseh and Rhode Island mines, secured from the St. Mary's Mineral Land Company, and the estate of the late Congressman Carlos D. Shelden. The stock certificates are marked $7.50 paid in, a total of $750,000. A two years' option is held on the lands. In the event of this being exercised, 49,000 shares will be paid for the same, the remaining 51,000 shares, or controlling interest, being retained by the Calumet & Hecla Mining Company. The Kearsarge lode traverses the lands for three-quarters of a mile, and there is available sufficient adjacent territory to double the size of the property. The Calumet & Hecla management will be in direct charge of the exploratory operations.

Operations at the Victoria stamp mill have started, only a day shift being employed. As soon as the necessary force can be secured, a night shift will be put to work, and the mill supplied with 300 tons of rock daily. Rock is shipped from the mine to the mill over the gravity tram. James P. Graves, of Boston, secretary of the company, was at the mine a short time ago. Captain Thomas Hooper, who has been in charge since work was resumed in March, 1899, will relinquish the superintendency in July, being succeeded by his son, George Hooper, at present mining captain. The machinery at the mine and stamp-mill is operated by means of power derived from the new Taylor hydraulic power plant at Glenn Falls, on the Ontonagon river, which is fully meeting expectations.

Scranton. June 25.

The Sibley breaker of the Elliot-McClure Company, near Scranton, was destroyed by fire June 23, while more than 700 men and boys were at work in and around the mine. It was one of the most exciting breaker fires in the anthracite region for many years, as it is rarely that one occurs in daylight. The loss is estimated at $165,000, which is fairly covered by insurance. Fortunately all the men and boys escaped, the company having a series of terraces built around the breaker for such an emergency. All the men, with the exception of three, escaped quickly by means of the slope. The three referred to were working in the fourth vein, recently opened, which is not yet connected with the slope. As the cage could not be lowered it was feared that they would be lost or suffocated. The happy thought occurred to a miner that they could be saved by gaining the third vein through the slope and then pulling the men up the shaft by a rope. When the rescue party reached the third vein and lowered the rope they found that the trio were ready at the foot of the shaft, and they were hauled up singly to safety. The shaft was thick with smoke and the rescue was attended with great danger. It is believed that the fire started in the engine room and that it swept up in the airway to the top of the breaker. The washery was also destroyed. There were

a large number of mules in the mine and for a time these were abandoned, but were rescued in the afternoon. This is the second time that the breaker has been destroyed by fire. It was first built in 1873 and burned down in February, 1886. It was rebuilt without delay and has been in operation since. Some new veins have been discovered recently and there is sufficient coal to be mined for the next 40 years. Judge McClure, of Lewisburg, is one of the principal owners. A new breaker is to be built as soon as possible.

The unfortunate feature, as far as the general public is concerned, is the fact that the Sibley colliery is adjacent to the Jermyn mines, where the miners have been on strike for the past four months. There are 600 men idle in the Jermyn mine, and with the 700 men and boys thrown out of work by the Sibley fire, the borough of Old Forge is liable to be wiped out temporarily.

An interesting development is promised in connection with the Schuylkill Coal and Land Company, which is generally considered a subsidiary concern of the Delaware & Hudson, acting in conjunction with the Pennsylvania Railroad. The Delaware & Hudson lines are fully 50 miles distant from the coal properties which have been acquired at a cost of $20,000,000, while the Pennsylvania system passes through the tracts. It is now reported that the Pennsylvania has leased the Wilkes-Barre & Eastern railroad, now a small and unimportant road, running from Wilkes-Barre to Stroudsburg, where it connects with the New York, Susquehanna & Western, and that it intends to establish a new route between the anthracite region and New York mainly as a coal-carrying road.

The Wilkes-Barre & Eastern and the Susquehanna & Western are now held by the Erie. Plans, it is said, have been made for the connection near Wilkes-Barre, and options have been secured for the land necessary to connect the road with the Delaware & Hudson. At present the Pennsylvania coal is taken by way of Philadelphia.

The Dodson Coal Company will build a new breaker on the site of the dilapidated Hooker breaker.

Umpire C. P. Neill has notified the Conciliation Board that he will be prepared to attend a meeting any date after July 2. On Monday the members of the board spent the night in the Plymouth mine of the Delaware & Hudson Company, investigating the grievance of the miners who claim that the company is not living up to the award of the umpire in connection with the payment for lifting boney. This grievance has been a difficult one to decide, both sides making contentions which obscured the complaint. It was finally decided that the only method of settling the trouble would be to inspect each of the 64 chambers and decide each case upon its individual merits. The task was quite a big one and each member expressed himself as having well earned his day's wages by the tramp through the mine.

The miners of the Hazleton district are agitating the question of compelling all their members to join the locals of the colliery at which they are employed. Many of the miners have joined the locals in the place where they reside, as they frequently work at some distant colliery, and that means a long walk to attend the meetings.

Prospecting for coal has been abandoned on the Varner land, near Berwick. Shoemaker & Breece, whose lease of the land has expired, have moved the drills and buildings. The manner in which the drilling has been carried on has been most discouraging to the farmers on whose lands the operations were conducted. They will refuse to grant further leases unless the prospectors file a bond in a substantial amount, to commence work within 90 days.

Officials of the Reading Coal Company last week inspected the Franklin colliery, where a complete electrical system has recently been installed. The colliery is lighted by electricity and that power is also used for haulage. It was stated that the Reading intends to equip all its collieries in the same manner.

There is still a great shortage of laborers, and work is almost impossible in some collieries. It is estimated that more than 20,000 men have not returned to the region since the suspension was declared off.

Great trouble has been experienced at the various collieries in the Hazleton district since the heavy rains. The Yorktown colliery was idle for one week, while others were in the same condition. Operations were also suspended in Nos. 9 and 11 collieries of the Lehigh Coal and Navigation Company.

Toronto, Ont. June 23.

Mining Inspector G. R. Mickle reports to the Bureau of Mines the discovery by Thomas Enright, of a smaltite and calcite vein rich in native silver on lot 1, concession 3, Coleman township, about three miles southeast of Cobalt town. Another find of a silver vein is reported on lot 6, concession 3, of Bucke township, some three miles north of the town. These discoveries, especially the former, are regarded as important as enlarging the known silver-bearing area. The Bucke township deposits, unlike many of those in Coleman, are not found on the surface but usually some distance below. Numerous other discoveries up the Montreal river and at other points at a distance from the Cobalt area are reported, and while some are corroborated by the display of samples, they are frequently found to be either unfounded or exaggerated.

Development and mining work are active at nearly all the leading mines. At the Foster mine prospectors have been busy ever since the spring set in. Twenty pronounced veins have been located, and 25 men are engaged in stripping and drifting, the latter process being continued in the old shaft at the 50-ft. level. A quantity of rich ore is in storage. At the University the men are actively engaged in stripping and several new veins have been found. A new vein has been found on the McKinley & Darragh property 5 in. wide and rich in silver. The Peterson Lake Mining Company has 25 men at work, with two steam drills. The company has lowered Peterson lake by deepening the outlet. Energetic prospecting is being carried on, and a nicolite vein was recently discovered on the southwest corner of the property. At the Tretheway 45 men are at work. Their last shipment to Newark, N. J., was made some weeks since, and all ore will hereafter be treated in Hamilton. A duplex 12-drill Rand compressor has been installed and a new shaft-house is nearly completed. A rich vein in the west working was lost some time since and was thought to have given out, owing to the proximity of the greenstone. This circumstance caused considerable anxiety, as indicating the probable shallowness of the productive rock. The vein, however, has recently been recovered within a distance of 8 ft. and is found to be still rich in silver. A shaft is being put down at the Silver Bar, formerly the Knight property, and machinery is being installed. The Nipissing Mining Company has now a force of 90 men at work, which will be increased to 200 as soon as the new buildings now in course of erection can accommodate that number. Despite the large shipments and heavy profits of this company, so far practically only two veins on a little corner of its extensive holdings have been worked, the shaft having been put down only 50 ft. The work thus far done is regarded as merely preliminary to future operations on an extended scale. A double-compartment shaft is being sunk at the Columbus mine to 110. ft. depth.

Victoria, B. C. June 19.

Crow's Nest Pass—The output of coal at the Crow's Nest Pass Coal Company's collieries during May exceeded that of any other month in the history of the company. The shipments from the two collieries the company is operating—its Carbonado colliery has lately been closed—were: Coal Creek colliery, 50,734 tons; Michel, 33,473; total, 84,207 tons. The highest tonnage of any previous month was that of March last, when a total of 81,273 tons were reached. Shipments of coke during May were: From Fernie ovens, 10,426 tons; Michel, 11,764; total, 22,190 tons. Slack from Coal Creek mines is coked at the Fernie ovens.

Boundary—The editor of the Phoenix *Pioneer*, who recently visited Franklin

camp, has published an account of his visit. Summarized, his comments are as follows: No other undeveloped part of the Boundary mining district is today attracting so much attention as is Franklin camp, situated between 40 and 50 miles north of the town of Grand Forks, at the headwaters of the north fork of Kettle river—a section that is still without railway communication and to which a wagon road is only now being completed by the Provincial Government. This camp, according to the map compiled by Prof. R. W. Brock, of the Geological Survey of Canada, who in 1901 did some field work in this locality, has a mineralized area 13 miles long and 5 miles wide. This much of the drainage area of the north fork has been proved, though it is known to extend much farther. The geological formation is lime, porphyry and conglomerate, surrounded by granite hills, and the ledges mostly have a northerly and southerly trend. Locally the district may be said to be divided into three smaller camps, known respectively as McKinley, Banner, and Mineral Hill, with others coming into prominence as development proceeds. Generally the ore of Franklin camp is a sulphide copper carrying also some gold and silver, and running rather higher in average value than that of the larger mines of other parts of the Boundary districts. In some parts of Franklin camp galena and zinc have been found, but it is the great ledges of copper ore, like those of Phoenix and Deadwood camps, that are expected to provide a large tonnage of ore after railway transportation shall have been provided and development work well advanced. The leading property of the camp is the McKinley, in which F. Aug. Heinze is understood to be largely interested. Development here includes 350 ft. of tunneling, which has proved an orebody some 200 ft. in width, and much surface stripping and ground sluicing, these determining the continuity of the ledge. The Diamond Drill Contracting Company, of Spokane, Wash., is now carrying out a contract providing for the boring of several thousand feet of drill holes.

The Gloucester group is understood to be under bond to the Dominion Copper Company, owning mines and a smelter near Phoenix and Greenwood. A 50-ft. shaft sunk in ore of good grade, and a 250-ft. cross-cut tunnel comprise the chief development work on this property. The Maple Leaf group has lately been bonded by H. W. Warrington, superintendent of the Kettle River Valley railway, and others. Open cuts show the occurrence on these claims of a large body of copper sulphide ore of excellent quality. On the Mineral Hill group a big ore body is exposed by a 200-ft. tunnel and a number of open cuts. On the Banner, development includes 200 ft. of tunneling and 60 ft. of sinking and cross-cutting, chiefly in a concentrating copper ore, with 4 ft. of galena ore also occuring on the property. There are numerous other claims in the camp, some of them with large surface showings of mineral. A contract has been let for the construction of 50 miles of railroad, from Grand Forks to the camp, so with the prospect of transportation facilities being provided much development work will be done during the ensuing summer and fall.

Mexico. June 16.

A. F. Holden, managing director of the United States Smelting, Refining and Mining Company, has just completed a thorough inspection of the company's recently acquired property in Pachuca, State of Hildago, the Real del Monte. This is one of the largest old properties in Mexico, and since acquired by the present company practically all work has been stopped in order to investigate it thoroughly, and plan extensions, alterations and improvements. The ores from this property are too silicious and not of a character that would serve as a basis for a smelting plant, as was suggested in a previous letter, but this company is quietly searching the entire Republic of Mexico for a favorable smelter location, and it is to be hoped that it may soon find what it is seeking. The country needs it.

The article of E. A. H. Tays in the JOURNAL of April 7, this year, on the Southern Pacific's projected railroad from Guaymas, Sonora, to Guadalajara, Jalisco, gives in a brief way an excellent idea what may be made of the mineral resources of the State of Sinaloa once railroad facilities are obtained, for its mountains abound in mineral wealth, which remains largely undeveloped because of the lack of transportation. The time to get in is before the railroad, while prices are reasonable.

It is understood that Epes Randolph, president of the Cananea, Yaqui River & Pacific Railroad, has obtained a concession from the Government of Sinaloa for the erection of a million-dollar (Mexican money) smelter at Mazatlan, preparatory to the building of the Guaymas-Guadalajara branch of the Southern Pacific. Robert McDoble, of San Francisco, is having plans drawn for the erection of a 5,000-h.p. electric plant, to cost in the neighborhood of $800,000 Mexican, on the Piaxtla river, for transmission to the camp of Guadalupe de Los Reyes in the Cosala district. Copper is particularly abundant in Sinaloa, as at Chiox, on the Tuerte river, San José de Gracia, Badarrihuato, Mocorito, Culican, and Cosala, and seems to be richer in gold as one goes south. At San Fernando, in Durango, 10 miles from the Sinaloa line, they are mining and treating in a small smelter. In the Rosario district the famous Tajo mines, Lewis Bradbury, Los Angeles, president and general manager, have been temporarily closed to reconstruct the reduction plant. It is being changed from amalgamation to cyanide, and increasing to a capacity of 250 tons. When finished a great deal of low-grade ore on the dumps can be treated at a profit. The San Luis Gonzaga group, together with 40,000 acres of timber land in the Badarrihuato district, has been sold by Manuel Gonzalez to American capitalists for $1,300,000 Mexican, and the new owners will put in a 250-ton lixiviation plant in the place of the old stamp-mill and concentration plant.

London. **June 16**

The English Crown Spelter Company, with mines in Italy and smelter at Swansea, does not depend so much on its own ores now, as it used to. The mine, while not exactly worked out, yields much less per annum nowadays. The ore raised during 1905 was 8253 tons, as compared with an average of 13,000 tons during the previous four years, and the average contents were 42¼ per cent.. as compared with 45 per cent. in 1904 and 47 in 1903. This ore yielded 5382 tons of calcined calamine and 627 tons of blende. In addition to this, 14,181 tons of low-grade dump ore were dressed and calcined, yielding 2407 tons of calcined calamine and 475 tons of blende. Purchases of other ores amounted to 6635 tons of blende from other districts of Italy, Tunis, etc. It will be remembered that some years ago a new property was acquired in North Wales, but this has never been a success, owing to the difficulty of separating the blende, galena and pyrite. This property has not been abandoned entirely, but has been leased to a company in the North of England, which may possibly make a success of it, and the English Crown Spelter Company has the right to purchase the whole of the output.

The Scotch shale oil industry has not been crushed by the Standard Oil Company. Ten years ago this was quite a possibility, but thanks to the Scottish temperament, John D. has been kept at bay. The Standard raid was felt to be a challenge to national honor north of the Tweed. Financially and technologically the methods of treatment were modernized and large sums of money were provided for the purpose of bringing the plant up-to-date. The result has been that all five companies operating in that district are doing well. Of these companies, four are of importance—Youngs, Pumpherston, Oakbank and Broxburn—and their gross profits during their last financial year amounted in the aggregate to £300,000. Of these profits about half was placed to reserve or allow for depreciation, and dividends averaging 15 per cent. were paid. For the past five years the financial history of these four companies has been equally good. The tendency is for prices of all products to drop, but improved methods and increased output more than make up the deficiency.

The gold yield from the State of New South Wales for the first four months of this year amounts to 102,722 oz. fine, which shows an increase of 25,934 oz. fine.

General Mining News.

Petroleum Exports—Exports of mineral oils from the United States for the five months ending May 31 are reported by the Bureau of Statistics of the Department of Commerce and Labor as follows, in gallons:

	1905.	1906.
Crude oil	38,179,126	50,096,847
Naphthas	11,895,453	16,927,783
Illuminating	333,147,038	318,724,260
Lubricating	40,948,989	70,175,212
Residuum	25,392,738	27,974,808
Total	451,563,344	483,898,910

Paraffin is included in lubricating oils. The total increase this year was 32,335,566 gal., or 7.2 per cent.

Guggenheim Exploration Company—A special meeting will be held July 2 for the purpose of increasing the capital stock of the company from $17,000,000 to $22,000,000. President Guggenheim says that the company has acquired, during the year, or has entered into contracts for purchase of large interests in important mining properties in Utah, Alaska, Yukon Territory and British Columbia. In so doing obligations of upward of $10,000,000 have been incurred. More purchases are contemplated, involving further outlays. The company's capital authorized is $17,000,000, of which $13,554,000 has actually been issued, and $14,090,000 issued and contracted for. The subscriptions for the new stock are payable as follows: $100, Aug. 1., 1906; $50, Oct. 1, 1906; $50, Dec. 1, 1906. No subscriptions will be received for fractional shares. Each holder of record will be entitled to subscribe to 50 per cent. of present holdings at $200 per share. All unsubscribed stock may be sold at discretion of the directors at not less than $200 per share.

ALABAMA.

Tennessee Coal, Iron and Railroad Company—Plans have been partly completed for the extension of this company's steel plant at Ensley. The reconstruction of Furnace No. 5 of the Ensley group is nearly completed, and this furnace will probably be blown early in July. Similar work on Furnace No. 4 is under way, the improvements, consisting in the building of automatic charging equipment, including a skip hoist, Brown patent top and the construction of bins for raw material. Additional engines and boilers are also being provided at the Ensley furnaces. The capacity of the open-hearth plant at Ensley is to be doubled. It has been decided to extend the duplex system which has been in use at this plant in the past two years. The present bessemer converter in which the metal is first introduced for a short desiliconizing blow will be reconstructed. A second converter will be installed with entirely new open hearth furnaces, which will be built at the end of the present group. Another mixer will also be provided and more cupola capacity for the melting of cold iron and scrap. A number of new boilers and additional gas producer capacity are also contemplated. After the building of the new furnaces, the number of which has not been definitely decided upon, the present open-hearth plant will receive attention, the purpose being to replace the 10 existing furnaces one by one with entirely new units. The furnaces to be built in the coming year will have a capacity of 25,000 tons a month. Alterations in the rail-mill equipment will increase the rolling capacity considerably. The rail mill steam plant will be equipped with automatic stokers; additional cranes will be installed; new soaking pits will be built and the capacity of the present pit furnaces increased. The erection of a central electric power station for the entire Ensley group of works has been decided upon. The generators will be driven by gas engines operating with blast furnace gas.

ARIZONA.

COCHISE COUNTY.

Shattuck-Arizona—Preparations are fast nearing completion for handling an output of 1500 tons per day at this mine. It is expected that in two months' time everything will be in readiness. The foundations for the big Allis-Chalmers double-drum hoist are in readiness for the machinery. The hoist will have a capacity of 1500 tons daily. The steam end will consist of two Corliss engines of the heavy-duty type, with cylinders 20x48 in., the engine being designed to withstand the excessive strains incident to hoisting work. The engine will operate at 125 lb. steam pressure, at which it will handle continuously a total unbalanced load of 15,000 lb. at a hoisting speed of 2000 ft. per minute. The engine is so designed that the steam pressure may be later raised to 150 lb., and is proportioned to handle the increased load which this pressure will make possible from the depth and at the speed above mentioned. There will be two drums 7 ft. in diameter, having turned grooves, each holding 1500 ft. of 1⅛-in. rope. These drums will be loose on the drum shaft and served by powerful friction clutches. The hoist will be entirely steam operated and embody latest practice in modern hoisting methods. Local conditions in this district surrounding previous installations of this size and character have precluded the use of drums, all the larger hoists being of the reel type. Work on the tramway is progressing rapidly. Record progress is being made in framing the timbers for the framework which is to carry the big bucket line from the mine to the El Paso & Southwestern track. The enlargement of the shaft has been completed, and when all the new equipment is in place Shattuck will be able to handle its output with ease.

CALIFORNIA.

ALPINE COUNTY.

Nevada Hercules Mining Company—Ore samples from this property at Loope, have been shipped to Reno for test. The mine is controlled by the Humphrey, Kirman and Moffitt interests in Reno. This property has already been extensively developed and arrangements are now being made to expend a large sum of money in still further equipping the property, more than doubling the present capacity.

AMADOR COUNTY.

Gold Top Gravel Company—This claim at Pine Grove (formerly the Wheeler) has been closed down, the water having been shut off, but it is expected that suitable arrangements will soon be made for starting up again.

Jose Gulch—The principal work now in hand is putting the ditch in condition to supply water for the mill. A number of men are engaged in cleaning the old Horn ditch. The mill is also being put in first-class shape.

BUTTE COUNTY.

At Oroville, O. B. Perry has purchased the American Gold Dredging Company's dredge and 275 acres of land, and also purchased from the Hilgers estate 210 acres of dredge land south of the property bought from the American company.

Gravel Strike—A rich strike was made a few days ago on the Dogtown ridge, six miles north of Cherokee, in a mine owned by the Hendrix brothers and P. M. Ream. For two years past the parties have been running a tunnel and finally encountered the channel, striking pay gravel running $5 in gold per cu.yd. The strike is an important one and will probably result in the opening up of the Blue Hog mine, an adjoining property, which is believed to be an upper extension of this channel.

MARIPOSA COUNTY.

Alice Gold Mining Company—This company, at Stud Horse, is now operating three stamps prospecting the ore from development work.

MONO COUNTY.

Grace Elmer—This claim, adjoining the True Friend group of mining claims at Masonic, has been leased by W. T. Elliott, C. T. Elliott, E. R. Elliott, Sam Smith and Minnie Smith to E. H. Claypool, representing Colorado capitalists, for a period of 18 months with the privilege of buying at any time during the period of said lease for $40,000.

NEVADA COUNTY.

Blue Tent—At this time Oscar Jones, superintendent, has 50 men at work and 20 stamps of the mill are kept running double shift. They are removing the pillars from the old workings and are driving through new ground to open up a virgin tract.

Ethel—The mill of this mine at Washington is to be enlarged without delay. The Ethel is turning out large quantities of good ore and the present facilities for handling the product are inadequate. The profits have been applied mainly to the development of the underground

workings with such good results that Superintendent Albert Maltman now estimates he has fully $200,000 worth of ore in sight.

PLACER COUNTY.

Vivian—Grading has begun for a 10-stamp mill on this mine near Greenwood. Chlorination works are being erected on the Standard mill at Coloma cañon near Greenwood, to work the sulphurets.

Union—This mine at El Dorado is now running with 30 men. Twenty stamps have been dropping during the past month. P. Humbert, who is now in possession of the property, is managing owner.

PLUMAS COUNTY.

Buckeye—At this mine, near Greenville, a vein has been tapped that will yield the owners a handsome sum. The vein of ore is 4 ft. wide.

SANTA CLARA COUNTY.

Quicksilver Mining Company—The results of operations for the fiscal year ended April 30, show gross earnings of $114,995, as compared with $109,334 in the previous fiscal year, an increase of $5,660. The operating expenses were $108,704, a decrease of $44,399. The net earnings were $6,291; add to this increase in ore account estimated at $9,058, making a profit for the year of $15,349. The decrease in the expenditure of $44,399 was made up principally of a decrease in the payroll of over $36,000, and in supplies of over $7,000.

SHASTA COUNTY.

Brunswick—This mine at French gulch, owned by F. B. Rossi, has been purchased by H. D. Lacy, of New York, who has held it under bond some time. A 20-stamp mill is to be installed. The property was formerly known as the Bodie and Ophir.

Washington—A gasolene engine and air compressor have been shipped from Portland to this mine, French gulch. Three shifts are at work at the mine running the main tunnel in a distance of 565 ft., where it is expected the ledge will be cut. The present owners are Walter Van Meter, Gus Reinhaus, Charles Fox, Joseph H. Porter, Clinton Watson and C. E. Gilzean.

Arps Group—It is reported that a wide ledge of good copper ore has been found in this group at Copper City. The Arps group is owned by William Arps and others, of Redding. It is under bond to J. Barton, of New York City.

SIERRA COUNTY.

Antelope Gold Mining Company—This company at Loyalton is installing an 8-h.p. engine and 4-in. pump for sinking purposes and will continue sinking to the 200-ft. level. The property is in Antelope Neck cañon, about four miles southwest from Loyalton.

TRINITY COUNTY.

Globe Mining Company—At Dedrick 18 men are at work in the mine and mill. The management is contemplating increasing the capacity of the mill. The air compressor plant, which was destroyed last year by fire, has been restored. The air compressor building is in a gulch two miles distant from the mine and is operated by water power. The mine has an elevation of 7400 ft. and the air compressor plant an elevation of 3600 ft.

COLORADO.

SUMMIT COUNTY.

The principal shipping mines of the Breckenridge district are keeping a string of teams hauling to the Colorado & Southern Railroad. The list includes the Old Union, Wellington, Lucky, Country Boy, Sallie Barber and Bullion King mines. The mills sending out concentrates are the Old Union, Lucky, Jessie and Minnie. The Country Boy will also figure in this list shortly.

Wire Patch—This mine is showing great activity. Mr. Putner has a large force of men getting the remodeled mill into shape. Two new 60-h.p. tubular boilers have been hauled up to the property and are being put in.

Laurium—This mine on Mount Baldy, now under the ownership of the Blue Flag Gold Mining Company, and management of Robert Niles, is to be worked on a larger scale than heretofore, and the stamp and amalgamation mill will be enlarged in order to treat four times the quantity of ore. This mine has now several thousand tons of ore blocked out ready for extraction.

Atlantic—The owners of this mine on North Star mountain, having decided that they were making too large a loss on shipping high-grade gold ore to the smelter, have now taken a long lease and option on the milling plants at the Montgomery camp, at the foot of Hoosier pass on the Alma side of the range, and are now getting the stamps and amalgamation plant into order for immediate work. The mill is also fitted with concentrators and a complete cyanide plant, which will be tried in turn in finding out the best method of handling the ore.

Reliance Dredge—This dredge in French gulch is credited with a daily average clean-up of $1000, at which rate the company will soon have the boat paid for and start payment of dividends.

Square Deal—A party of officers and stockholders in the Square Deal Mining and Development Company, operating at Frisco, arriving in camp the latter part of the week, and are stopping over to take a general look around the camp. The management has started the main camp and workings in North Ten Mile canon and the main tunnel into Chief mountain is now in 75 ft., and is in solid mica chist.

SAN MIGUEL COUNTY.

Black Bear Mining Company—At this company's property in Ingram basin, five miles east of Telluride, a force of men is engaged blasting out a large chamber for an electric hoist. Preparations are also being made for the construction of a 10-stamp mill at the top of Ingram Falls, one mile this side of the mines, and by the end of the month work on the same will have begun. In course of the season a wire-rope tramway will be erected connecting the mines with the mill. The Black Bear is one of the biggest propositions in the district, the group comprising 14 patented claims, a placer and mill site, and a number of unpatented lodes. The principal vein, an extension of the Argentine and Cincinnati, is from 6 to 16 ft. wide carrying gold, silver, lead, copper, and zinc. Leonard Kaanta and P. Servio, of Telluride, are president and secretary of the company.

Buckeye Mining and Leasing Company—Three months ago this company secured a five-years' lease on the Butterfly-Terrible group of mines and 30-stamp mill, at Ophir Loop, 14 miles from Telluride. It is now engaged in driving with machine drills the large mill tunnel level which will cut the Ida ore shoot 500 ft. vertically beneath the third level the next working above. A winze has been put down from this level showing the ore shoot to extend down for an indefinite distance, and between the two workings it is estimated to contain 118,000 tons of ore. To reach a point about the middle of the shoot it will be necessary to drive the tunnel 2000 ft. farther, when an upraise will be made to the third level. James L. Brown, of Telluride, is western manager of the company. Mat Mongrandi, of Telluride, is leasing between the first level and surface on this property, and treating his product at 10 stamps of the Butterfly mill.

IDAHO.

BLAINE COUNTY.

Eclipse Mining Company—This company bought, about a year ago, the Allegheny-Pittsburg group in Croy gulch. It has now purchased the Wolftone group adjoining, and is making arrangements to work on a large scale. The headquarters of the company are at Iola, Kan. W. E. King, late of Joplin, Mo., is general manager in charge.

IOWA.

WEBSTER COUNTY.

The Hawkeye Plaster Company and the Iowa Hard Plaster Company are the names of two new companies just formed for the purpose of mining gypsum and making plaster. Both companies will have their mills ready for operation by the first of the year in the vicinity of Carbon station, adjacent to Fort Dodge. The capital stock of the concerns will be $200,000 each, and all of the stock has been taken by home capitalists. With the completion of the two mills there will be in all

11 large stucco mills operating adjacent to Fort Dodge. J. J. Ryan, J. B. Butler, Fred Larrabee and Mr. Heath are promoting one and C. F. Duncombe and J. F. McNamara the other company.

KANSAS.

CHEROKEE COUNTY.

New Century Zinc and Lead Mining Company—This company, operating at Galena, has elected the following officers: President and treasurer, Charles M. Burgess, New Britain, Conn.; vice-president, David N. Camp, New Britain, Conn; Attorney, M. E. Cerloes.

KENTUCKY.

PIKE COUNTY.

Big Sandy Company—this company, which owns a large property in the Elkhorn coalfield, reports leases made to the following concerns:

Greenough Coal and Coke Company, capital $100,000; Neil Brennan, of Shamokin, Penn., president; George P. Bedlow, of Pikeville, Ky., superintendent. This company has two mines, one on the upper Elkhorn and one on the lower Elkhorn seam, with a daily capacity of 1500 tons.

Pike Coal and Coke Company, capital $100,000; president, Charles E. Hellier, of Boston, Mass.; manager, Lowry Lewis of Childress, Ky. This company has two mines, one on the lower Elkhorn and one on the upper Elkhorn seam, with a capacity of 1500 tons a day.

Henry Clay Coke and Coal Company, capital $100,000; owned by Mr. William Beury, of Philadelphia; Dr. Evans, of Lookout, Ky., general manager; J. W. Cockerill, Lookout, Ky., superintendent. This company has two mines, one on the upper and one on the lower Elkhorn seam, with a capacity of 1000 tons a day.

Edgewater Coal & Coke Company, capital $100,000; president and general manager, George T. Honaker, of Lookout, Ky. This company has two mines; capacity 1500 tons a day.

Marrowbone Coal and Coke Company, capital $100,000; R. C. Peacock, of Lookout, Ky., manager. Mines to be developed.

MICHIGAN.

Cleveland Cliffs Iron Company—This company is offering to its stockholders an issue of $1,110,000 in 5 per cent. bonds. These proceeds are to be used to pay for three large steamers for carrying ore, which are now under construction.

HOUGHTON COUNTY—COPPER.

Osceola Consolidated Mining Company—The directors have declared a dividend of $6 per share, payable July 25 to stockholders of record on July 5. This dividend is somewhat in excess of expectations. The last dividend was $4, in January, so that present payment will make $10 for the year.

Tamarack Mining Company—The directors have declared a dividend of $2 per share, payable July 21, to stockholders of record on July 2. It had been reported that no dividend would be paid, on account of losses resulting from the fire at the mine. The last dividend was $3, in January. The present one will make $5 for the year.

MONTANA.

JEFFERSON COUNTY.

Liverpool Mining Company—This company, operating in Lump gulch, has its main shaft now down 750 ft., and is shipping steadily to the smelter. The ore is a high-grade silver lead.

NEW MEXICO.

SANTA FE COUNTY.

Gold Bullion Mining Company—This company will soon start its new dredge on its property in the Golden mining district, in the southern part of the county. The property includes 480 acres of placer ground, about a mile from the town of Golden. J. A. Wood is superintendent.

PENNSYLVANIA.

BITUMINOUS COAL.

Pittsburg-Buffalo Coal Company—This company has bought 652 acres of coal land near Zollarsville, in Washington county. The land adjoins property already owned by the company, where two large openings are being made.

Waltersburg Coal and Coke Company—This company, which recently bought a large tract of coal land and the Edna Coke works with 35 ovens, near Helen, Penn., is opening a new shaft on the property, and has begun to build 115 new coke-ovens.

SOUTH DAKOTA.

CUSTER COUNTY.

F. H. Lode—A large vein of ore has just been encountered in this property. It carries gold and is rich in wolframite. It is the first wolframite in quantity to be discovered in this immediate vicinity.

Ruperta—The mill on this property is nearing completion and will start up as soon as word is received from the directors. The company owns a large acreage with gold-bearing veins.

LAWRENCE COUNTY.

Imperial—Another strike has been made on the Rudolph claim of this company. An incline tunnel was run from the Dakota line and the orebody encountered after about 25 ft. of work. The ore, which is found in the flat, is from 6 to 8 ft.-thick cyaniding ore.

Iowa—Work has begun on this property. The company owns 72 acres adjoining the Columbus ground, near Central. Three different veins of ore have been uncovered, all giving good working values. The character of the ore is free-milling, with some concentrates. The company will now proceed to develop systematically.

Branch Mint—Work on the railroad from the mill to the mine will be completed soon. Sixty men are now employed, 25 of whom are working in the mine cutting stations in the working shaft and running drifts. Work on the mill has been delayed because of a lack of sufficient labor.

Penobscot—The 200-ton cyanide plant of this company is running at full capacity and two cars of high-grade ore are being shipped weekly to the smelters in Denver. The company is working now to develop a vertical which was recently encountered.

Minnesota—The directors of this company, which has property lying in the Garden City district, near the Penobscot, have just made a tour of inspection and decided to erect a mill. A number of men are now employed and drifts are being run from the 62 and 100-ft. levels.

Reliance—Work on the mill is progressing well. The building will be 200x140x104 ft. It is a wet crushing cyanide with a capacity of from 150 to 200 tons a day, with the filter-press process for the treatment of the slimes. It will contain a No. 5 Gates crusher, rolls and 6-ft. Huntington mills. The ore will practically all be handled by gravity, there being only one elevator in the mill.

TEXAS.

LEON COUNTY.

Beargrass Coal Company—This company has been organized at Hillsboro to develop lignite deposits. The company owns about 1600 acres of land containing deposits which are said to be from 8 to 14 ft. in thickness, and expects to begin operations as soon as practicable. Machinery will be required for running the plant, but details have not as yet been determined. Officers of the company are: A. J. Jasper, Hillsboro, president; W. G. Bartels, Carlinville, Ill., vice-president and general manager, and S. C. Dyer, Hillsboro, secretary and treasurer.

UTAH.

BEAVER COUNTY.

Oak Leaf—This property, located in the Granite district, will begin shipping soon.

SUMMIT COUNTY

Park City Ore Shipments—Last week aggregated 4,160,460 lb., the shippers and amounts being; Daly Judge, 1,129,000 lb. Daly Judge (zinc middlings) 197, 000; Kearns-Kieth, 167,000; Silver King, 1,149,460; Little Bell 381,000 lb. ore.

WYOMING.

SWEETWATER COUNTY.

Union Pacific Coal Company—This company is preparing to open new coal mines at Thayer, north of the Rock Spring mines. Sidings have been put in, and machinery is being shipped to the mines.

Foreign Mining News.

MEXICO.

CHIHUAHUA.

The Guadalupe mine—formerly the Buena Ventura—at Parral, is shipping daily a carload of silver ore. Most of it will average 2 kg. silver to the ton. The mine is north of the Palmilla.

AFRICA.

RHODESIA.

The gold production in May was 46,729 oz. bullion, an increase of 15,096 oz. over May, 1905. For the five months ending May 31 the total was 215,796 oz. bullion, showing an increase of 53,170 oz., or 32.7 per cent., over the corresponding period in 1905. The bullion reported this year was equal to 192,068 oz. fine gold, or $3,970,046 in value.

EUROPE.

RUSSIA.

A recent official report gives the gold refined in Russia in 1905 as follows, the quantity being reduced to ounces of fine gold:

	Ounces.
State refinery (Imperial Mint)	795,388
Russo-Chinese Bank	90,751
Imperial domain	10,146
Total	896,285
Value	$18,526,211

In this statement, of course, no allowance is made for gold not reported to the authorities. As we have heretofore remarked, this was, probably, a larger amount than usual.

The Imperial Mint reports no gold coinage in 1905. The coinage of silver, 900 fine, was only 20,515 one-ruble pieces. Of subsidiary silver, 500 fine, there were coined 2,200,000 pieces of 20 Kopeks; 3,600,000 of 15 Kopeks; 2,500,000 of 10 Kopeks, and 500,000 of 5 Kopeks.

Coal Trade Review.

NEW YORK, June 27.

With the settlements reached in Ohio and in the Southwest the coal strike of 1906 may be considered practically closed. There remains only the Clearfield district of Pennsylvania, where the stubborn resistance on both sides to a compromise seems likely to put the district out of the coal trade entirely for the current year.

The Western coal trade is now in its regular summer course. The only drawback at the present time is that the trade up the Lakes is unsettled. There is an improvement manifest during the past week, however; but it looks as if the competition of Illinois coal, which was felt last year, will again be a factor in the Lake trade.

The anthracite region is in its usual summer course of production, the only drawback being a scarcity of laborers in some districts, and interruption of work at several collieries by excessive rains. The latter is only a temporary drawback.

Recent purchases of lands in the anthracite country have started all sorts of reports of new combinations and alliances. Most of them seem to have little real foundation, but some are worth further consideration.

COAL TRAFFIC NOTES.

The coal trade and coke traffic originating on all lines of the Pennsylvania Railroad east of Pittsburg and Erie for the year to June 16, was as follows, in short tons:

	1905.	1906.	Changes.
Anthracite	2,154,439	1,891,035	D. 263,404
Bituminous	12,800,388	14,362,619	I. 1,562,231
Coke	5,060,825	5,830 398	I. 769,573
Total	20,015,652	22,184,052	I. 2,068,400

Shipments of Broad Top coal over the Huntingdon & Broad Top Railroad for the week ending June 23 were 12,646 tons: for the year to June 23 they were 372,674 tons.

The coal and coke tonnage of the Baltimore & Ohio Railroad for the four months ending April 30 is reported as below:

	1905.	1906.	Changes.
Anthracite	378.260	260,101	D. 118,159
Bituminous	7,042,111	8,344,547	I. 1,302,436
Coke	1,439,650	1,982,112	I. 542,462
Total	8,860,021	10,586,760	I. 1,726,739

The total increase this year was 19.5 per cent.

Shipments of coal and coke over the Norfolk & Western Railway for the four months ending April 30 were, in short tons:

	Coal.	Coke.	Total.
To Line points	2,735,196	770,464	3,505,660
To Tidewater	1,127,707	60,018	1,187,725
Total	3,862,903	830,482	4,693,385

As compared with 1905 there was an increase of 598,252 tons of coal and 14,667 tons of coke; a total of 612,919 tons. The gain in line shipments was 507,141 tons; in tidewater, 105,778 tons.

Bunker coal—that is coal furnished to steamships—in April is reported by the Bureau of Statistics at 533,466 tons; of which 118,814 tons wer to coastwise vessels and 414,652 tons foreign-bound steamers.

Coastwise shipments of coal from Atlantic ports for the four months ending April 30 are reported as below:

	Anthracite.	Bituminous.	Total.
New York	4,675,115	3,220,800	7,895,915
Philadelphia	478 439	1,386,391	1,864,830
Baltimore	52,212	1,102,321	1,154,533
Newport News	.....	987,773	987,773
Norfolk	.....	761,232	761,232
Total	5,205,766	7,458,517	13,664,283

The total increase over 1905 was 872,503 tons. New York includes all the New York harbor shipping points.

New York. June 27.

The hard-coal market is exceedingly quiet as regards new business, for future delivery, but is fairly active in disposing of coal now arriving at tidewater. The close of the month naturally stimulates a little buying for the sake of the 10c. to be saved. Dealers are all resigned to a dull Summer.

Prices remain as follows: $4.45 for broken and $4.70 for egg, stove and chestnut sizes For steam sizes: $3 for pea; $2.25@2.50 for buckwheat; $1.45@$1.50 for rice and $1.30@1.35 for barley f.o.b. New York harbor shipping points. On July 1, there will be 10c. a ton added to the large sizes.

BITUMINOUS.

Trade in the far East is quiet and is confined principally to contract business, which is limited. There is very little current business. The Sound is doing but a small amount of trade and what shipments are made are done under pressure. New York harbor trade is quiet, with prices ranging around $2.60@2.70 for good grades of steam coal and $2.50@2.60 for gas coal, f.o.b. New York harbor shipping points. Considerable trouble is caused by the embargo recently placed on different classes of cars over the Baltimore & Ohio Railroad and tributaries. The road's arbitrary action in this matter is commented upon in the trade. All-rail trade is quiet, although some small outside business is seen. Transportation is good and car supply outside of the B. & O. is sufficient.

Vessels in the coastwise market are in good supply in New York harbor ports, but are scarce at the lower ports. Current rates from Philadelphia are quoted as follows: To Boston, Salem and Portland, 60@70c.; to Providence, New Bedford and the Sound, 60c.; to Lynn, Newburyport and Bangor, 80@85c.; to Portsmouth and Bath, 70@75c.; to Saco and Gardiner, 90c. and towages.

Chicago. June 25.

The local coal market continues quiet, with supplies of western and eastern coal so plentiful as to cause resumption of the old conditions of competition and selling at very slight profits for most dealers. There is no evidence that there will be extensive buying before autumn, of either bituminous or anthracite. Shipments from the Illinois and Indiana fields are so plentiful as to cause apprehension of the old conditions of forced demurrage sales at actual losses. Run-of-mine brings $1.70@2; screenings, $1.40@1.70 and lump (in very light demand), $2@2.30. Hocking is about $3.05, the tendency being under rather than over. Smokeless has a fair market for the season of the year, at about $3.30 per ton.

Hartshorne, Ind. Ter. June 20.

At the annual meeting of the Southwestern Interstate Coal Operators' Association held in Kansas City, Mo., June 12, the agreement formulated by the representatives of the operators and miners

the previous week was ratified and the following officers for the ensuing year were elected: President, William Perry; vice-presidents, William Busby, at large, James Hamilton, district 14, Carl Scholtz, district 21, and R. G. Rhombaur, district 25; secretary, S. J. Tonkin; assistant secretary and treasurer, W. S. Newcomb. Executive and scale committees for each district were also chosen.

The Southwestern Interstate Coal Operators' Association embraces district 14, Kansas; district 25, Missouri; and district 21, Arkansas and Indian Territory. District 21 did include Texas, but all Texas members have been expelled for deserting the operators' ranks in the recent strike.

The joint conference of representatives of the miners and operators, which was in session for three weeks at Kansas City, reached an agreement on Friday, June 8, which was the adoption of the 1903 scale of prices and conditions, with some slight modifications in conditions. This means a continuation of the same mining prices that were in effect when work suspended, and an advance of 5.9 per cent. in all day work, yardage and dead work.

This agreement was referred to the miners for a referendum vote, and was ratified. Orders were sent out to all locals June 15, to return to work at once, and this is being generally done, except in a few cases where the men are refusing to go to work with men employed during the suspension, but this action is in violation of the understanding reached, which was that all old men should be restored to their former positions, and that all men who worked during the suspension may be retained without prejudice at any work which will not prevent the restoration of old employees to their former positions.

Some of the modifications in the conditions of the 1903 scale are as follows:

Provision for a penalty or indemnity, to be collected from the United Mine Workers in case a mine is thrown idle in violation of the agreement, amounting to 50c. per day for each man idle.

Provision for a permanent arbitration board to settle all disputes which cannot be otherwise settled.

Provision for the engineers to continue at work to protect property in case of a suspension of work at the expiration of the agreement.

The agreement is made for two years from April 1, 1906, to March 31, 1908. It was in the nature of a compromise, the operators demanding a continuation of the 1904 scale of prices with some modifications in conditions, while the miners demanded the restoration of the 1903 prices and conditions with an addition of 3c. per ton to the running price.

Pittsburg. June 26.

Coal—The settlement of the mining rate in the Western States has not caused any falling off in the demand in the Pittsburg district, and the mines continue in operation to capacity. There is an adequate supply of railroad cars and shipments are heavy, an unusually large tonnage going to lake ports for the Northwestern markets. According to a report made by Vice-President W. R. Woodford to the executive board of the Pittsburg Coal Company, the company has orders booked that will keep the mines in steady operation the rest of the year. He reported that prices are higher than at any time in the past two years, and that the profits of the company for this year are double those for the corresponding time last year. There is no change in quotations, prices being on a basis of $1.10 a ton for mine-run coal at the mine.

Connellsville Coke—Both production and shipments were greater last week, but prices remain about the same, furnace coke being quoted at $2.35@2.45, and foundry $2.60@2.75. The production for the week, according to the *Courier*, was 272,311 tons. The shipments aggregated 14,646 cars, distributed as follows: To Pittsburg, 4,933 cars; to points west of Pittsburg, 7919 cars; to points east of Connellsville, 1794 cars. The production in the lower Connellsville region amounted to 104,379 tons.

Foreign Coal Trade.

June 27.

The new Spanish tariff fixes import duties on fuel at 2.50 pesetas—48¼c.—per metric ton on coal and 4 pesetas—77.2c.—per ton on coke.

Imports of coal into Germany for the four months ending April 30 were in metric tons:

	1905.	1906.	Changes.
Coal	3,235,416	2,540,448	D. 694,968
Brown coal	2,669,996	2,765,648	I. 95,652
Total	5,905,412	5,306,096	D. 599,316

Owing to the adoption of a new system of classifying coke and briquets, only the imports for April of this year can be given. Coke imports for April were: Coke made from coal, 34,056; from brown coal, 3963; total 38,019. Briquets from coal, 9721; from brown coal, or lignite, 3759; total, 13,480 tons.

Exports of coal from Germany for the four months ending April 30 were, in metric tons;

	1905.	1906.	Changes.
Coal	5,413,723	6,721,562	I. 1,307,839
Brown coal	6,300	6,566	I. 266
Total	5,420,023	6,728,128	I. 1,308,105

Exports of coke in April were; Coke from coal 263,444; from brown coal, 174; total 263,818 tons. Of these exports 6370 tons were to the United States. Exports of briquets in April were: From coal 55,515; from brown coal, 21,902; total, 77,417 tons.

Exports of coal and coke from Great Britain, with coal sent abroad for the use of steamships engaged in foreign trade, for the five months ending May 31, were as follows, in long tons:

	1905.	1906.	Changes.
Coal	19,061,304	22,282,645	I. 3,218,341
Coke	267,179	287,429	I. 20,250
Briquets	441,417	600,572	I. 159,155
Total exports	19,772,900	23,170,646	I. 3,397,746
Steamer coal	7,015,698	7,538,014	I. 522,316
Total	26,788,598	30,708,660	I. 3,920,062

This shows an increase of 14.6 per cent. in the total coal consumed beyond the limits of the United Kingdom. The coal exported to the United States for the five months, included above, was as follows:

	1905.	1906.	Changes.
Atlantic ports	16,443	20,384	I. 3,941
Pacific ports	34,660	20,463	D. 14,197
Total	51,103	40,847	D. 10,256

The larger exports this year were to France, 3,964,439 tons; Italy, 3,552,002; Germany, 2,841,303; Sweden, 1,185,648; Spain, 1,180,252; Egypt 1,110,572; Denmark, 1,013,178 tons.

Iron Trade Review.

NEW YORK, June 27.

The abrupt cut in Southern foundry iron, announced in our columns last week, is still the chief topic of discussion. The cut involved the breaking of the agreement made by the leading Southern companies to keep iron prices firm on the basis of $14, Birmingham, for No. 2 foundry. The cut was to a basis of $13, but with a subsequent reaction to $13.25, or even $13.50; but prices are irregular.

There are several theories afloat about this action. Some people claim that the Gates party, which now controls the Tennessee-Republic combination, want to coerce the Sloss-Sheffield Company into entering the consolidation, and that this is a preliminary step. Others, with some show of reason, argue that Southern sales had been falling off for various reasons, and that lower prices were needed to help trade. Others, again, believe that the cut was intended chiefly, or solely, to affect the stock market. They recall the similar action taken by the American Steel and Wire Company, then under Gates control, in 1900, and the effect which it had on industrial stocks. This last theory comes, probably, nearest the truth.

Northern furnaces have not followed the cut, and are trying to hold prices firm. They are helped by the continued strong demand for bessemer and basic iron; though some concessions on foundry pig seem probable.

The finished material market continues unchanged, with strong demand for most classes of steel products, and the mills everywhere busy. In some quarters a disposition to hasten deliveries on contracts is reported. Upon the whole the trade is in good condition.

Reports from abroad show increased activity in the iron and steel trades. Both in Germany and Great Britain demand is good, for export as well as for home trade.

Birmingham. June 25.

The reduction in pig-iron quotations, which caused considerable comment during the past week, brought about considerable trading in iron and the sales which were completed will aggregate more than 50,000 tons. Orders have been booked for a large tonnage, delivery during the last half of the year. All sorts of rumors were current in regard to the break in the market and several causes were given. The statement was made that an effort would be made to force the Sloss-Sheffield Steel and Iron Company into a consolidation with the Tennessee-Republic Company, but President J. C. Maben asserted that there was very little trading being done in preferred stock in the Sloss-Sheffield Company and the active trading in common was simply the same stock being traded over and over again. As to the breaking of the agreement it was stated that while the companies holding prices up to $14 per ton, No. 2 foundry, the smaller manufacturers were selling iron right along at 25 to 50c. under the price quoted and the larger manufacturers were getting the worst end of the deal. The Sloss-Sheffield Company withdrew from the agreement and notified agents that iron would be sold at $13.50 per ton. There was a small lot of iron sold at $13. Mr. Maben states that if iron was sold at $13 per ton for No. 2 foundry, the product was disposed of at a cheaper price than was necessary. The waiting game on the part of the consumers of pig iron is believed to be over now. Some of the larger consumers are said to be buying liberally in the market at prices under $13.50, and at that quotation, the Sloss-Sheffield Company is said to have sold 25,000 tons of iron during the past week and is negotiating for the sale of the 40,000 tons more.

Chicago. June 25.

Though the drop in Southern prices has affected the local market in a broad way by reducing the cost of pig iron from 50c. to $1 for many smelters, it has not brought about any great change in the amount of sales. A few heavy contracts have been placed, but in general buying continues quiet, the consumer not yet being willing to contract generally for his supplies six to eight months ahead. There had been cutting of the standard quotation of $14 on Southern for some time before the announcement of the disruption, and any users of iron could obtain nearly the same quotations that he gets today, provided he was alive to the situation.

Sales of Northern have been good in quantity, and the price holds up well to the former quotation, $18 for No. 2. With the settlement of the molders' strike or its extinguishment, we may look for substantial increase in the local sales of both Northern and Southern.

Iron and steel products are steady, though there is no boom anywhere. Coke is in better demand, but the supply is abundant, and Connellsville continues $5.50.

Cleveland. June 26.

Iron Ore—Complaints are heard that the analysis of bessemer ore being delivered on contract is below specification. This, with the increased demand for steel-making irons, has brought a good demand for that ore with the result that prices are higher by 25c. to 50c. The supply is so short that sales cannot be made, mines being run to full capacity to meet contract requirements. Wild rates are as yet 75c. from the head of the lakes; 70c. from Marquette and 60c. from Escanaba.

Pig Iron—The heavy buying the past week, coupled with the shut-down of three furnaces and the turning of two others into the production of bessemer and basic, has shortened the supply and has brought an upward tendency to prices. The termination of a trade war between two big interests also checked the weakness in the market. Some few furnaces are still willing to take $16.50 in the Valleys for No. 2, although most producers are holding for $16.75@17 in the Valleys. Southern producers sold a little iron at $13, Birmingham, but are advancing their prices now.

Finished Material—Deliveries on structural are a little easier from the big mills. Three new ships are under contract on the lakes and orders will be announced in a short time. Bars are stronger, the demand being good. Billets are scarce and high, the forging quality selling at $35 Pittsburg.

New York. June 27.

Pig Iron—The feature has been the sharp cut in Southern foundry, which was followed by the placing of large orders. Northern furnaces have tried to hold their prices and have done so nominally, but sales have been small, and some concessions seem inevitable. The Southern situation is commented on elsewhere. For the present, at least, the market is uncertain.

Current quotations for pig iron are, for New York or parallel delivery:

Northern:	
No. 1 X foundry	$18.50@$19
No. 2 X foundry	17.75@18.50
No. 2 plain	17.25@17.75
Forge pig	16@16.50
Southern:	
No. 1 foundry	17.50@18
No. 2 foundry	17@17.50
No. 3 foundry	16.50@16.75
No. 4 foundry	15.75@16.25
No. 1 soft	17 50@18
No. 2 soft	17@17.50
Gray forge	15@15.50
Basic pig:	
Northern	17.50@17.75
Virginia	18.60
Alabama	17.75@18.25

City or local deliveries are not included in prices, which are for large lots, on dock or cars.

Structural Material—Prices are nominally unchanged. Beams under 15in. are 1.845c. for large lots; over 15in., 1.895c.; angle and channels, 1.845c., tidewater delivery. A large part of the business here is done by jobbers, who are asking 2.50c. for beams and channels out of stock. Some large orders are in view, including the Grand Central terminals in New York, which will require about 24,000 tons. Bridge Commissioner Stevenson, of New York, has awarded the contract for the steel work of the Manhattan bridge to the Ryan-Parker Construction Company, this company's bid of $6,493,223 being the lowest. Under the terms of the contract the work must be finished by Dec. 15, 1909. What mills will furnish the steel is not known.

Philadelphia. June 27.

Pig Iron—The shake given to the pig iron situation last week by the small volcano in Alabama has not resulted in anything serious. It brought out quite a number of buyers who were led to anticipate concessions, but the only result has been some little irregularity on certain brands and a steadying of prices on all others. The transactions of the past six days have been made up of small lots of foundry of various kinds and a few lots of forge, but the biggest sales were in basic for delivery during the third quarter. It is believed that the situation will right itself in a few days and that the average run of buyers will not profit much by the cut in Southern iron last week. It may be said that prices are strong and that there is a good deal of inquiry. Quotations may be given at about $19.25 for No.1X; $18.50 for No. 2X; $18 for No. 2 plain; $16@16.50 for gray forge; bessemer, $20; basic, $17.75.

Steel Billets—Open-hearth steel is very strong at $29 and a good week's business has been done.

Bars—More or less shading has come over bar iron and large consumers are crowding their advantage to the wall.

Sheets—The storekeepers throughout this territory appear to be monopolizing most of the trade at present.

Pipes and Tubes—The pipe market is quite strong

Plate—While the business of the plate mills just at present is not particularly active it is known that there is a great deal of business close in sight.

Steel Rails—Most of this week's business in steel rails has been made up of comparatively small orders.

Old Rails—Old rails are quoted at $20.50 but buyers say that figure is entirely unwarranted.

Scrap—Railroad scrap has fallen in price and one or two lots sold as low as $18. Machinery scrap is selling at $15 and No. 1 steel scrap at $16. Very little is ward weakness.

Pittsburg. June 26.

The bessemer pig-iron market is stronger than at any time this year, but the foundry and forge markets are a trifle weaker. Sales of bessemer iron have been made at $17.75, Valley furnaces, for delivery in the third quarter, for various tonnages, the largest being 2000 tons. The disruption of the Southern pig-iron agreement does not seem to have had any effect on the market here. There have been a number of rumors during the past few days regarding purchases of bessemer pig by the Youngstown Sheet and Tube Company for its new steel plant being built at Youngstown. O., which is expected to be ready for operation on Sept. 1. As told several weeks ago the company closed contracts with four Valley furnaces for five years, calling for the delivery of 15,000 tons monthly. On Friday it was reported that it had closed with the Ohio Iron and Steel Company for the entire output of Mary furnace at Lowellville for a period of 10 years. This furnace produces about 400 tons daily. While this report has not been officially confirmed, it is generally credited in iron circles here, although the tonnage said to be under contract seems to be in excess of the probable requirements of the Youngstown interest. The plant is to be put on billets and bars and it is reported that the capacity will not exceed 1000 tons of steel a day. It is difficult to estimate the unsold tonnage of bessemer iron for third quarter but it has been placed at about 25,000 tons. If the Lackawanna Steel Company and the Jones & Laughlin Steel Company come into the market, as they are expected to do shortly, there is not likely to be much iron available for the coming quarter. A number of inquiries have been received for fourth-quarter bessemer, which is unusual for this period of the year, and indicates that the market will be strong all year. The price named by some interests for the last quarter is $17.75, Valley furnaces, and while it is rather early to make a positive prediction it does not seem unlikely that that will be the minimum price. Basic iron is stronger this week, a few small sales having been made at $17.15, Valley furnaces. Foundry No. 2, that appeared to be firm at $16.50, Valley, last week, is quoted as low as $16. No sales of any consequence, however, are recorded at less than $16.25.

The feature of the steel market is the advance of $1 a ton in sheet-bars by the Carnegie Steel Company for the third quarter, making the price $29, the highest for several years, and $3 a ton higher than in the first quarter. Sales at that figure may not be great, but this will be immaterial to the leading interest, as it can put its steel into rails and has no difficulty in selling the rails at $28. The company is booking rail business for this year's delivery every week and yesterday received an order for 4200 tons of standard rails from a Western trolley road. It also got an order for 12,500 tons for next year for the Minneapolis, St. Paul & Sault Ste. Marie Railroad. The Carnegie Company's rail production for this year it is estimated will exceed 1,000,000 tons, and the production of the United States Steel Corporation will be nearly 2,000,000 tons. The Youngstown plant was operated on rails only six months in 1905, and this year it went on rails on March 18 and will continue the rest of the year.

Contrary to expectations, the independent sheet and tin-plate interests did not reach a settlement with the Amalgamated Association of Iron, Steel and Tin Workers on the wage scale for the year beginning July 1. A demand was made for a concession from the scale signed with the American Sheet and Tin Plate Company. The contention was made that of its 178 sheet mills the leading interest only operates 71 on a union basis and has an advantage at its non-union mills of about 18 per cent. in cost of production. The independents wanted a reduction of about 14 per cent. to put them on an equal footing. This statement was denied and the Amalgamated Association has ordered the new scales printed. If they are not signed by June 30, when the present agreement expires, strikes will be ordered at the independent mills. This may benefit the American Company, as it is not operating more than 80 per cent. of its 178 sheet mills and of its 258 tin-plate mills only 153 are running. The sheet and tin-plate trade is in excellent shape, and there is no difficulty in obtaining the prices recently established. The structural and plate markets are as strong as ever and new business is being booked almost daily. There is some weakness in both iron and steel bars and it is reported that prices are being shaded but the report lacks confirmation.

Pig Iron—Sales of bessemer iron in lots ranging from 200 to 2000 tons aggregating over 5000 tons have been made, exclusive of the deal made by the Youngstown Sheet and Tube Company, at prices ranging from $17.75 to $18, Valley furnaces. Basic is strong at $17@17.15, Valley. Foundry iron is weak, No. 2 grade being quoted at $16@16.25, Valley, but for very small lots $16.50 has been paid. There is nothing doing in gray forge and the price is about $16.35, Pittsburg.

Steel—Bessemer billets are strong at $27 and open-hearth at $28. Sheet-bars are quoted at $29 for third quarter. Plates are strong at 1.60c. and merchant steel bars are still quoted at 1.50c.

Sheets—The sheet market is remarkably strong for this period of the year and mills are away behind in deliveries. Black sheets are firm at 2.50c. and galvanized at 3.55c. for No. 28 gage.

Ferro-Manganese—The market shows a decided improvement and prices are higher, $85@90 being quoted for this and next month and $80@85 for the rest of the third quarter.

Cartagena, Spain. June 9.

Iron and Manganiferous Ores—Messrs. Barrington & Holt report that shipments for the week were one cargo, 2550 tons Calasparra magnetic; two cargoes, 4850 tons manganiferous, and two cargoes 5450 tons dry ore, all to Great Britain.

The local iron-ore trade remains very steady, and there are more orders and contracts on hand than can be comfortably executed. There are good inquiries for contracts for 1907 shipment, and some sales are already reported at further improved prices.

Freight rates remain favorable to shippers.

Quotations are unchanged, at 8s. 8d.@ 8s. 11d. for ordinary 50 per cent. ore; 9s. 2d.@9s. 5d. for special low phosphorus ore; 12s. 1d. for specular ore, 58 per cent.; 10s. 3d. for S. P. Campanil. Manganiferous ores range from 11s. 10d. for 35 per cent. iron and 12 manganese up to 18s. 3d. for 20 per cent. iron and 20 manganese. All prices are f.o.b. shipping port.

Pyrites—Iron pyrites, 40 per cent. iron and 43 sulphur, are quoted at 10s. 8d. per ton, f.o.b. shipping port. Exports for the week were 530 tons iron pyrites to France.

London. June 17.

The Board of Trade returns of foreign trade, just issued, value the exports of iron and steel from Great Britain, for the five months ending May 31, as below:

	1905.	1906.	Changes.
Iron and Steel..	£12,439,277	£15,427,300	I. £2,988,023
Machinery.....	9,099,143	10,710,723	I. 1,611,580
New Ships.....	1,557,258	2,486,615	I. 929,357
Total.....	£23,095,678	£28,624,638	I. £5,528,960

The large gain—23.9 per cent.—in the total values is a sign of the present good condition of trade. In one point there was a decrease; the exports of mining machinery, valued at £359,975 in 1905, were £291,118 in 1906. This shows a loss of £68,857, due largely to smaller orders from Australia and South Africa.

The chief items of the iron and steel exports in the five months were, in long tons:

	1905.	1906.	Changes.
Pig iron.....	354,704	548,678	I. 193,974
Wrought iron.....	71,994	79,354	I. 7,360
Rails.....	219,377	164,479	D. 54,898
Plates.....	73,442	99,223	I. 25,781
Steel shapes, etc.....	79,959	105,098	I. 25,139
Sheets.....	168,035	184,626	I. 16,591
Tin-plates.....	157,242	152,742	D. 4,500

The total quantities of iron and steel were 1,424,613 tons in 1905, and 1,732,513 tons in 1906; an increase of 307,900 tons, or 21.6 per cent. Exports of pig iron to the United States were 63,434 tons in 1905, and 96,322 tons in 1906, an increase of 32,888 tons; of tin-plates, 28,489 tons in 1905, and 20,582 tons in 1906, a decrease of 7907 tons.

Imports of iron and steel and of machinery into Great Britain for the five

months ending May 31, were valued as below:

	1905.	1906.	Changes.
Iron and steel...	£3,388,736	£4,024,843	I. £636,107
Machinery.....	2,071,260	2,185,203	I. 113,943
Total.....	£5,459,996	£6,210,046	I. £750,050

The chief item of the imports of iron and steel were, in long tons:

	1905.	1906.	Changes.
Pig iron.....	51,550	34,556	D. 16,994
Wrought iron...	33,656	54,009	I. 20,353
Steel billets, etc.....	245,584	263 873	I. 18,289
Bars and shapes.....	18,301	27,528	I. 9,227
Structural steel....	44,706	71,879	I. 27,173

The total quantities of iron and steel imported were 539,309 tons in 1905, and 617,654 tons in 1906; an increase of 78,345 tons, or 14.5 per cent.

Imports of iron ores of all kinds into Great Britain for the five months were, in long tons:

	1905.	1906.	Changes.
Manganiferous..	119.882	149,979	I. 30,097
Iron ores.....	2,826,425	3,308,298	I. 481,873
Total.....	2,946,307	3,458,277	I. 511,970

Spain furnished 89,654 tons of manganiferous ore, and 2,615,670 tons of iron ore this year. The total increase was 17.4 per cent.

Chemicals.

NEW YORK, June 27.

Copper Sulphate—Business is quiet, with no material change. Quotations are $6@6.25 per 100 lb., according to size and conditions of order.

Nitrate of Soda—The market is much stronger; though current sales are quiet. deliveries on contract are good. The present quotations are 2.40c. for 96 per cent., and 2.32½ for 95 per cent., an advance over recent figures.

Jackson Brothers write from Valparaiso, Chile, under date of May 23: Inquiry has continued to prevail, and prices are higher, 8s. 2½d. being asked for 95 per cent. for 1906 deliveries. Refined has been sold for 8s. 4½d. for same delivery. This price of 8s. 2½d., alongside, with an all round freight of 20s., works out $2.42 per cwt., delivered, net cost and freight, without purchasing commission.

For the four months ending April 30, production was 11,559,154 quintals, and exports 10,622,472 quintals; a decrease, as compared with 1905, of 448,457 quintals in production, but an increase of 140,703 quintals in exports.

Sulphur—The Board of Trade returns give the imports of sulphur, and of pyrites valued chiefly for the sulphur contents, into Great Britain, for the five months ending May 31, as below, in long tons:

	1905.	1906.	Changes.
Brimstone.....	157,651	164,460	I. 6,809
Pyrites.....	310,722	332,345	I. 21,623

Making the usual allowance for the contents of the pyrites, the imports were equivalent to 281,940 tons of sulphur in 1905, and 297,398 tons 1906; an increase of 15,458 tons, or 2.2 per cent.

Metal Market.

New York, June 27.

Gold and Silver Exports and Imports.

At all United States Ports in May and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
May 1906...	$5 716,898	$33,950,671	Imp. $28,233,773
" 1905 .	481,570	2 657 143	" 2,175,573
Year 1906..	28,349,072	59,239,334	" 30,890,262
" 1905..	35,800,708	14,460,402	Exp. 21,340,396
Silver:			
May 1906...	5,544,546	4,370,788	Exp. 1,173,758
" 1905 ..	5,426,590	3,742,113	" 1,684,477
Year 1906 ..	28,923,841	19 844,412	" 9,079,429
" 1905 ..	20,326,631	11,817,345	" 8,509,286

These statements cover the total movement of gold and silver to and from the United States. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York.

For week ending June 23, and years from Jan. 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week....	$11,000	$ 104,387	$ 890,737	$ 75,535
1906.....	5,734 521	44,691 293	29,815.137	1,028,203
1905.....	33 531,946	5,827,847	15,457 852	1,829,665
1904.....	63,848,162	3 435,755	19,860.324	409,266

The gold exported for the week went to Mexico; the silver nearly all to London. Imports, both gold and silver, were from Mexico, Central and South America.

The statement of the New York banks—including all the banks represented in the Clearing House—for the week ending June 16, gives the following totals, comparisons being made with the corresponding week of 1905:

	1905.	1906.
Loans and discounts..	$1,102,812,700	$1,057,758,360
Deposits.....	1,146,792,900	1,049,472,300
Circulation.....	48,060,700	48,471,100
Specie	214,369,600	188,883,800
Legal tenders.....	87,423,300	84,397,200
Total Reserve.....	$301,792,900	$273,281,000
Legal requirements....	286,698,225	262,368,075
Surplus reserve.....	$15,094,675	$10,912,925

Changes for the week this year were increases of $3,526,800 in specie, $635,300 in legal tenders, $1,290,200 in deposits and $3,839,550 in surplus reserve; decreases of $2,318,000 in loans and $16,300 in circulation.

The following table shows the specie holdings of the leading banks of the world.

	Gold.	Silver.	Total.
New York.....	.....	.....	$188,883,500
England.....	$185,865,760	.....	185,865,760
France.....	589,745,365	$213,766,770	803,512,135
Germany.....	191,885,000	63,965,000	255,850,000
Spain.....	75,730,000	123,135,000	198,865,000
Netherlands...	27,614,000	29,088,500	56,702,500
Belgium.....	16,226.665	8,113,335	24,340,000
Italy.....	145,005,000	15,485,000	160,490,000
Russia.....	501,455,000	28,625,000	530,080,000
Austria.	233,885,000	63,880,000	297,765,000

The returns of the associated banks of New York are of date June 23, and the others June 22. The foreign bank statements are from the *Commercial and Financial Chronicle*, of New York. The New York banks do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows for the year to June 14:

	1905.	1906.	Changes.
India.....	£ 3,275,871	£ 8,496,113	I. £ 5,220,242
China....	502.968	.....	D. 502.968
Straits..	2,800	1,750	D. 1,050
Total.....	£ 3,781,639	£ 8,497,863	I. £ 4,716,224

Imports for the week were £211,000 in bars and £14,000 in Mexican dollars; a total of £225,000, all from New York. Exports were £161,200 in bars and £89,800 in Mexican dollars; £251,000 in all, to India.

Indian exchange has been steady, all the Council bills offered in London having been taken at 16d. per rupee. The sales of silver for India have fallen off considerably.

The movement of gold and silver in Great Britain for the five months ending May 31, is reported as follows:

Gold:	1905.	1906.
Imports.....	£ 16,284,206	£ 20,660,013
Exports..... ..	9,929,435	16,920,029
Excess, imports..	£ 6.354,771	£ 3,739,984
Silver:		
Exports	5,826,654	9,092,738
Imports.....	5,378,383	8,792,056
Excess, exports.....	£ 448,271	£ 300,682

Of the silver imported this year £7,625,504, or 83.9 per cent. of the total, came from the United States.

Prices of Foreign Coins.

	Bid.	Asked.
Mexican dollars.....	$0.50¾	$0.53½
Peruvian soles and Chilean.....	0.46¾	0.49½
Victoria sovereigns.....	4.85½	4.87½
Twenty francs.	3.86	3.89
Spanish 25 pesetas...	4.78	4 80

Other Metals.

Daily Prices of Metals in New York.

June	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
21	18⅝ @18¾	18¼ @18⅜	84¼	39⅛	5.75	6.10	5.95
22	18⅝ @18¾	18¼ @18⅜	83½	39⅝	5.75	6.10	5.95
23	18⅝ @18¾	18¼ @18½	....	39⅝	5.75	6.05	5.90
25	18⅝ @18¾	18¼ @18½	81⅞	39	5.75	6.00 @6.05	5.85 @5.90
26	18⅝ @18¾	18¼ @18⅜	81 3/16	38½	5.75	6.00 @6.05	5.85 @5.90
27	18⅝ @18¾	18¾ @18⅝	81⅞	38¾	5.75	6.00 @6.05	5.85 @5.90

London quotations are per long ton (2,240 lb) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars. The price of cathodes is usally 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting & Refining Co. for near-by shipments of desilverized lead in 50-ton lots, or larger orders. The quotations in spelter are for ordinary western brands; special brands command a premium.

SILVER AND STERLING EXCHANGE.

June.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	June.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
21	4.85	65⅛	30 1/16	25	4.85	65	30 1/16
22	4.85¼	65¼	30 1/16	26	4.85	65	30 1/16
23	4.85	65¼	30 1/16	27	4.84¾	65	30 1/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

The silver market has been quiet for several days. There has been no special demand, and consequently prices have receded slightly. The Indian Government is still presumably a moderate buyer.

Copper—Owing to the unsettled conditions generally, consumers are inclined to await developments, the domestic consumers being already well supplied for near-by requirements, while the foreign also are holding off. Business is therefore practically at a standstill. Under more liberal offerings, especially for near-by shipments, prices have eased off slightly, but at the close the market is entirely nominal at 18⅝@18¾ for lake; 18¼@18½ for electrolytic in cakes, wirebars or ingots; and 18@18¼ for casting copper.

The standard market is assuming its normal proportion to refined sorts and the close is steady at £81 17s. 6d. for spot and £81 for three months. Refined and manufactured sorts, we quote; English tough, £87@£87 10s; best selected, £88@£89; strong sheets, £97.

Exports of copper from New York for the week were 2140 long tons. Our special correspondent reports the exports from Baltimore for the week at 2423 long tons. Baltimore exports also includeed 112,380 lb copper sulphate.

Imports of copper and copper material into Great Britain for the five months ended May 31, are given below; the totals being the contents of all material in fine copper:

	1905.	1906.	Changes.
Copper ore	37,548	38,809	I. 1,261
Matte and precipitate	27,817	31,217	I. 3,400
Fine copper	31,692	30,917	D. 775
Totals	49,356	50,407	I. 1,051
Exports	16,405	18,461	I. 2,056
Balance, imports	32,951	31,946	D. 1,005

Of the imports this year 1995 tons of metal and 9286 tons of fine copper were from the United States; against 2063 tons of metal and 14,600 tons fine copper last year.

Tin—Prices have fluctuated within narrow limits and business is of a retail character. The close in London is cabled as £177 for spot and £176 5s. for three months, while prices in New York market rule between 38⅝ tnd 38¾c.

Imports and exports of tin in Great Britain for the five months ending May 31 were as follows, in long tons:

	1905.	1906.	Changes.
Straits	13,201	14 502	I. 1,301
Australia	1,476	1,711	I. 235
Other Countries	495	1,212	I. 717
Total imports	15,172	17,425	I. 2.253
Re-exports	10,992	13,456	I. 2,464
Exports	3,009	3,268	I. 259
Total exp	14,001	16,724	I. 2,723
Balance, imports	1,171	701	I. 470

The re-exports were largely of Straits tin sent to the United States.

Lead—The market is steady and quotations are unchanged at 5.75c. New York. Prices in London have eased off somewhat, and the quotations at the close are cabled as £16 12s. 6d. for Spanish, and £16 15s. for English lead.

Imports and exports of lead in Great Britain for the five months ended May 31 were as follows, in long tons:

	1905.	1906.	Changes.
United States	10,495	8,723	D. 1,772
Spain	42,026	46,110	I. 4,094
Australia	35,888	21,055	D. 14,833
Germany	6,524	8,059	I. 1,535
Other countries	1,036	1,685	I. 649
Total imports	95,969	85,632	D. 10,337
Exports	17,109	18,487	I. 1,378
Net imports	78,860	67,145	D. 11,715

The lead credited to the United States is chiefly Mexican lead, refined here in bond and re-exported.

St. Louis Lead Market—The John Wahl Commission Company telegraphs us on June 27 as follows; Lead is dull and slowly declining. The latest sale here was on a basis of 5.87½c. for Missouri brands.

Spanish Lead Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of June 9, that silver has been 13.50 reales per ounce. Exchange is 27.64 pesetas to £1. Pig lead is 77.75 reales per quintal; equal, on current exchange, to £15 15s. 1d. per long ton, f.o.b. Cartagena. Exports were 66 tons desilverized and 282 tons argentiferous to Marseilles; 150 tons argentiferous and 550 tons desilverized lead to Great Britain.

Spelter—Owing to an entire absence of demand, prices have given way from day to day, and the close is easy at 5.85@5.90 St. Louis, and 6@6.05c. New York.

The London market has also receded during the week, and the close is cabled as £27 for good ordinaries and £27 5s. for specials.

Imports and exports of spelter in Great Britain for the five months ended May 31 were, in long tons:

	1905.	1906.	Changes
Spelter	35,212	35,922	I. 710
Zinc sheets, etc	8,035	7,727	D. 308
Total imports	43,247	43,649	I. 402
Exports	3,466	3,101	D. 365
Net imports	39,781	40,548	I. 767

Imports of zinc ores are not reported separately. It may be noted also, that the returns take no account of spelter exported in the form of brass.

Spanish Zinc Ore Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of June 9, that the market has been quiet and unchanged. Exports for the week were 550 tons calamine to Antwerp.

Zinc Sheets—The price of zinc sheets is $7.90 per 100 lb. (less discount of 8 per cent.) f. o. b. cars for Lasalle and Peru, in 600-lb. cases for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; and lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 lb. The fluctuations in the base price for sheet zinc since Jan. 1, 1906, have been as follows: Jan. 6, 1906, $8; Feb. 5, $7.75; May 18, $7.65; June 9, $7.75; June 18, $7.90.

Antimony—Buyers are covered, and the market is nominal at the last quotations.

Nickel—Quotations for large lots, New York or other parallel delivery, as made by the chief producer, are 40@45c. per lb. for large orders according to size of order and terms. For small lots, 50@65c. is charged.

A contract has been made by M. Borne to furnish 50,000 tons of nickel ore from his Eremberie mine, near Paita, New Caledonia. The price agreed upon is 500 fr. per metric ton for ore carrying 6 per cent. nickel; 550 fr. for 6½ per cent.; 600 fr. for 7 per cent.; 650 fr. for 7½ per cent., and 700 fr. for 8 per cent. or over.

Platinum—Demand is strong and steady. Prices are undeveloped, $26 per ounce in New York. From $20 to 23 per ounce is paid for scrap platinum.

Quicksilver—The metal is firm and New York prices are still $41 per flask of 75 lb. for lots of 100 flasks or over, and $42 for small lots down to 10 flasks. For retail quantities, under 10 flasks, pound prices are charged. which work out to about $43 per flask. San Francisco prices are firm at $39.50 for domestic orders and $38 for export. The London price is £7 7s. 6d. per flask, but jobbers ask £7 10s.

Imports of quicksilver in Great Britain for the five months ended May 31 were 2,315,668 lb. in 1905, and 1,559,382 lb. in 1906; a decrease of 756,286 lb. Re-exports of imported metal were 810,101 lb. in 1905, and 922,448 lb. in 1906; an increase of 112,347 lb. this year.

Aluminum—List prices of the chief maker are as follows, for ingots; No. 1, over 99 per cent. pure, 38c. per lb. in less than 100-lb. lots, 36c. in lots of 100 lb. up to one ton, and 35c. in ton lots; No. 2, over 90 per cent., 35c., 43c. and 33c., as above. Granulated metal is 1c. per lb. over price of ingots. Rolled sheets from 44c. up, according to size.

Missouri Ore Market.

June 23.

The highest price paid for zinc ore was $50 per ton, the assay basis price was $46, and the average price of all grades for the week was $46.12 per ton.

The highest price paid for lead ore was $90 per ton for one bin of ore, medium grades selling at $84@86 per ton. The average price of all grades was $83.26 per ton.

The zinc market was apparently strong up to Thursday, when a break was imminent from the fact that several buyers were not in the market for ore. On Thursday $50 was paid, but on Friday offerings were $1 to $2 per ton lower. Lead declined also at the end of the week, some buyers reducing their offerings to $81 per ton.

Following are the shipments of zinc and lead ore from the various camps of the district for the week ending today:

	Zinc, lb.	Lead, lb.	Value.
Carterville-Webb City.	2,465,380	667,130	$84,722
Joplin	2,619,500	297,800	75,176
Galena-Empire	1,135,680	240,560	39,940
Duenweg	713,000	103,730	20,755
Oronogo	603,220	16,720	14,008
Alba	485,790	.....	11,658
Prosperity	134,400	188,010	10,987
Granby	515,000	75,000	10,830
Aurora	502,550	.....	10,170
Badger	248,570	.....	5,865
Neck City	205,890	.....	4,940
Spurgeon	188,730	38,510	4,895
Carthage	180,340	.....	4,328
Sherwood	119,960	25,640	3,955
Zincite	102,150	2,060	2,534
Stott City	34,750	13,120	1,333
Totals	10,254,910	1,668,280	$306,096
25 weeks	261,504,390	36,506,150	$7,047,742

Zinc value, the week, $236,540; 25 weeks, $5,654,361.
Lead value, the week, 69,556; 25 weeks, 1,395,381.

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months; the average for zinc being based on the prices of assay basis ores carrying 60 per cent. zinc:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1905.	1906.	Month.	1905.	1906.
January	52.00	47.38	January	61.50	75.20
February	52.77	47.37	February	57.62	72.83
March	47.40	42.68	March	57.20	73.73
April	42.88	44.63	April	58.00	75.13
May	43.31	40.51	May	58 27	78.40
June	40.75	....	June	57.80	....
July	43.00	....	July	58.00	..
August	48.83	....	August	58.00	....
September	46.75	....	September	63.50	....
October	47.60	....	October	63.86	....
November	49.55	....	November	68.67	....
December	49.00	....	December	76.25	....

Wisconsin Ore Market.

PLATTEVILLE, June 23.

There has been considerable speculation as to the continued increase in the price of 60 per cent. zinc. Some buyers were slow about making any bids and the producers were inclined to be as independent, apparently holding for better prices. The latter part of the week, however, found the buyers getting busy and a heavy demand developed for high-grade ore. There was a distinct improvement in price of all grades, but the sales of the week are off as compared with last week. Conditions at the furnaces are reported as satisfactory. It is the opinion of the producers generally that July will see the price of zinc reach the top notch again, and some are still holding their ore, with that fact in mind.

The price of lead remained steady at $38 per thousand. Sulphur and drybone continue at old prices, with a strong demand for pyrites.

The camps of the Platteville district loaded ore as follows for the week:

Camps.	Zinc, Lb.	Lead, Lb.	Sulphur, Lb.
Platteville	142,110	34,070	....
Cuba City	254,000	.....	.....
Linden	204,350	36,400	.....
Highland	182,800	.....	.....
Rewey	122,000	76,000	.....
Benton	110,100	.....	.....
Mineral Point	43,100	....	.....
Hazel Green-Buncombe	27,300	.....	.....
Montfort	.....	.....	130,000
Harker	.....	.....	36,500
Total for week	1,085,760	146,470	166,500
Year to June 23	32,254,720	1,830,070	3,199,180

In the district at present, one source of trouble is the shortage of competent labor which is falling behind the demand as new enterprises are opened up. Five years ago there was an abundance of labor, unskilled it is true, but nevertheless willing to learn; today, even unskilled labor is at a premium. In comparison with other years, the month of June, 1906, exceeds all in the way of production, development work and installation of new machinery.

Mining Stocks.

NEW YORK, June 27.

The stock market has been marked by a general depression during the week. Some operators have it that this is due to the resentment of certain large operators at government action against corporations. That is Wall Street's theory just now, and is good as far as it goes. The curb market and the mining stock lists were quiet and weak, in accordance with the general market. Amalgamated Copper was down to $97¾ on Tuesday.

It is reported that Standard Oil stock is to be largely increased, the idea being that smaller dividends may serve to allay popular resentment against the company. Another report is that the Standard will be split up into several companies.

Anaconda and Amalgamated were helped on Tuesday by the declaration of the quarterly dividend on Anaconda stock, which is payable July 18. This is $1.37½ per share—5½ per cent. on par value—and compares with $1.12½ paid last April, and $0.87½ in January. The January dividend was for the last quarter of 1905; the other two make $2.50 or 10 per cent., for the first half of the current year.

Boston. June 26.

There has been a steady liquidation of mining shares the last week, notwithstanding the many favorable features in the way of increased dividends. Prices close materially lower than a week back for the active stocks, and the lowest prices were seen today, when Amalgamated was driven down to $96.62½, which is almost an $8 decline from the close of a week ago. Prices, however, recovered sharply, being $2.62½ in the case of the latter. In addition the Osceola has declared a semi-annual dividend of $6, which compares with $4, paid last December, and $2 at this time last year. Whereas no dividend was expected by the Tamarack now, that company has declared a semi-annual dividend of $2, which compares with $3, paid six months ago, and $2 a year ago.

Osceola has varied from $108 to $106, during the week. Tamarack closes the same as a week back at $95. Copper Range broke $5 to $69.50, recovering $1.75, and Mohawk is off $4.50 to $59.50. Parrot broke $3.12½ to $24, closing at $25 tonight, and Utah sold off $7 to $53.75, recovering $1 of this. United Copper made a spurt advance of $6 to $67.75 last week, subsequently touching $62. United States Smelting ran off $1.75 to $55.50, and North Butte broke $4,62½ to $83.50, the latter closing at $85. Tecumseh fell $1.75 to $9.25, but recovered to $10. Trinity advanced $1.12½ to $9 in a weak market. Allouez is off $1.50 to $35, Centennial $1.50 to $20, and Bingham $3 to $27. Boston Consolidated broke $3.50 to $24.25, and Greene $1.25 to $23.75.

On the curb Arizona Commercial sold down $9 to $38 on free realizing, and Butte Coalition $3.87½ to $28. Raven touched $1.37½, while Utah Apex, which fell $1, recovered the loss.

Colorado Springs. June 22.

The market in Cripple Creek shares on the Exchange has been quite active during the past week, and several of the stocks in the mines list have scored gains. The listing committee of the Exchange will soon pass upon the industrials that will be dealt in, according to the recent decision to create a market here for this class of stocks. The Exchange has re-elected F. F. Castello, president, and W. P. Kinney, secretary and treasurer.

There is a rumor that a gigantic merger is under negotiation, to include all the largest mines and mills of the district.

San Francisco. June 21.

While outside business does not make much showing yet, the stock markets are being carried on even better than had been expected, under present conditions here. The Comstocks have been rather weak and unsteady, but Tonopah shares have held up well. It is evident that the future of our market lies in those stocks.

Rumors have been current of a big consolidation, to take in several of the best known Tonopah companies. It has been impossible to follow these up, or to ascertain whether there is any foundation for them in fact.

New Dividends.

Company.	Payable.	Rate.	Amt.
Ala. & Georgia Iron	July 2	$1.00	$6,500
Anaconda Copper	July 18	1.37½	1,650,000
Central Coal & Coke	July 16	1.50	76,825
Central Coal & Coke, pfd	July 16	1 25	23,437
Guanajuato Con	July 31	0.06¼	33,750
Nipissing Mines Co	July 20	0.15	180,000
North Star Mines Co	July 6	0 20	50,000
Philadelphia Co	Aug. 1	0.75	434,296
Tenn. Coal, Iron & R. R.	Aug. 1	1.00	225,536
Tenn. C., I. & R. R., pf	Aug. 1	2.00	4,960
U. S. Smelting & Ref	July 16	0 87½	656,250

Assessments.

Company.	Delinq.	Sale.	Amt.
Alpha Con., Nev	July 10	July 31	$0.05
Belcher, Nev	.....	.....	0.10
Bullion, Nev	July 10	Aug. 1	0.05
Con. Cal. & Va	July 9	July 30	0.25
Gold Chest, Utah	July 14	Aug. 2	0.004
Jenny Lind, Cal	July 10	July 26	0.04
Justice, Nev	July 11	Aug. 2	0.05
N. Y. Bonanza Utah	July 7	July 28	0.03
Portland Park, Utah	July 9	July 30	0.01
Republican, Cal	July 12	Aug. 7	0.07
Sister, Idaho	July 5	Aug. 4	0.005

Tonopah Stocks

June 27.

(Revised by Weir Bros. & Co., New York.)

	High.	Low.	Last.
Tonopah Mine of Nevada	19.12½	19.00	19.00
Tonopah Montana	2 88	2.86	2.87
Tonopah Extension	5 87½	5.50	5.50
Tonopah Midway	2.16	2.14	2.15
Tonopah West End	2.60	2.60	2.60
Goldfield Mining Co	.43	.42	.43
Jumbo Mining	1.33	1.32	1.33
Red Top	1.44	1.43	1.44
Sandstorm	.59	.59	.59
Montgomery Shoshone Cons	15.25	15.25	15.25
Eclipse-Bullfrog	.89	.87	.88
Denver-Bullfrog	1.40	1.40	1.40

St. Louis.

June 23.

Adams, $0.40—$0.25; American Nettie, $0.15—$0.12; Center Creek, $2.50—$2.00; Central Coal and Coke, $65 00—$64.50; Central Coal and Coke, pfd., $80.00—$79.00; Central Oil, $60.00—$57.00; Columbia, $5.00—$2.00; Con. Coal, $24.00—$22 00; Doe Run (old stock), $350.00 - $300.00; Granite Bimetalic, $0.25—$0.20; St. Joe (old stock), $32.00—$30.00.

LONDON. (*By Cable.**)

June 27.

Dolores, £2 6s. 3d.; Stratton's Independence, £0 4s. 6d.; Camp Bird, £1 5s. 0d.; Esperanza, £3 17s. 6d.; Tomboy, £1 5s. 0d.; El Oro, £1 5s. 7½d.; Oroville, £0 17s. 9d.; Somera, £0 3s. 9d.; Utah Apex, £1 3s. 9d.

*Furnished by Hayden, Stone & Co., New York.

COLORADO SPRINGS.

June 23.

Name of Company.	High	Low	Clg	Sales
Acacia	.14	.12¾	.14	48,500
C. C. Con	.04⅝	.04½	.04½	
Elkton	.45	.40	.45	6,000
El Paso	.42½	.40¼	.42¼	5,400
Findlay	.75	.74¾	.75	6,000
Isabella	.23¼	.20¾	.22½	19,000
Mollie Gibson	.04⅛	.04	.04½	
Nevin	.04⅛	.03⅞	.04⅛	4,000
Pharmacist	.04¼	.04¼	.04¼	1,000
Portland	1.50	1.50	1.50	500
Vindicator	.90	.90	.90	300
Work	.10¼	.09¾	.10	12,000

SAN FRANCISCO.

June 21.

Name of Company.	High	Low	Clg	Sales
Best & Belcher	.66	.65	.66	1,200
Caledonia	.32	.25	.32	1,400
Challar	.10	.06	.09	8,800
Con. Cal. & Va	.78	.62	.75	9 100
Crown Point	.13	.11	.11	1,500
Gould & Curry	.12	.10	.11	2 400
Hale & Norcross	1.10	.90	1.00	1,800
Mexican	.68	.61	.64	3,600
Ophir	3.65	3.45	3.65	1,450
Overman	.07	.07	.07	1,400
Potosi	.08	.03	.07	2,300
Savage	.94	.77	.91	3,800
Sierra Nevada	.19	.15	.17	1,600
Standard Con	2.00	1.75	2.00	
Bullfrog Mining	.40	.37	.37	14,350
Diamondfield	.36	.32	.32	12,200
Jim Butler	1.27½	1.20	1.27½	4,900
Kendall	.63	.58	.58	1 000
MacNamara	.90	.85	.89	31,800
Manhattan Dexter	.60	.35	.43	55,800
North Star	.41	.39	.40	4 950
Original Bullfrog	.14	.12	.12	11,000
Tonopah Belmont	5.75	5.62½	5.62½	1,400

STOCK QUOTATIONS.

NEW YORK.

Week June 26

Name of Company.	High	Low	Clg.	Sales
Amalgamated	105½	96⅜	99⅝	610,715
Anaconda	253½	228	245	232,150
Balaklala Mining	15⅝	14	14	
British Col. Copper	7⅞	7⅛	7⅛	1,850
Butte Coalition	32	29	29⅞	2,100
Cum. Ely Mining	6¾	6⅜	6⅜	4,525
Greene Gold	3¼	3	3	5,610
Greene Gold & Silver	2¼	1⅝	1⅝	12,100
Guanajuato	5⅞	5¾	5¼	5,800
Micmac	4⅜	4	4⅜	12,010
Mines Securities	¼	¼	¼	
Mitchell Mining	7⅝	6	6¾	4,675
Nev. Utah M. & S.	4	3⅝	3⅝	4,400
Nipissing Mines	5⅞	5⅛	5⅛	66,900
Tennessee Copper	43	41	42	1,200
Union Copper	1¾	1½	1⅝	1,550
Utah Apex	5¾	5¼	5¾	200

NEW YORK INDUSTRIALS.

Am. Smelting & Ref.	151½	142¾	146½	191,050
Am. Smelt. & Ref., Pf.*	117	115	115	4,400
Bethlehem Steel	27½	27	27½	700
Colo. Fuel & Iron	54⅛	46⅜	48⅛	148,300
Federal M. & S., Pf.*	97¾	94	94⅞	2,200
Inter. Salt	34⅜	32½	33	820
National Lead*	76	70	72½	19,460
National Lead, Pf*	101	100½	101	1,070
Pittsburg Coal	14	14	14	200
Republic I. & S.	29½	26¾	27⅝	11,300
Republic I. & S., Pf.*	100	95¾	95¾	3,700
Sloss-Sheffield	74⅛	70½	72	8,200
Tenn. C. & I.	155⅛	152	153¼	2,800
U. S. Red. & Ref	37	33¼	33⅜	3,200
U. S. Red. & Ref., Pf.	80½	74	74	2,300
U. S. Steel	39⅛	35¾	36⅝	473,470
U. S. Steel, Pf.	105¼	102	103¼	88,620
Va. Car. Chem	41	35⅞	36	6,450

* Ex. div.

These stocks, not elsewhere quoted, had the following range of prices during the week: (New York) Atlanta, .17½—.17; Bamb. Delamar, 7; Comstock, .19—.18; Gugg. Exp., 284½; Mont. Sho. Con. (New), 16—15; St'd Oil, 618—599. (Boston) Ahmeek, 80—78; Ariz. Com'l, 48½—40; Black Mt., 9⅛—8¾; Cal. & Pitts., 31⅝; East Butte, 9¾—9; Keweenaw, 11—9; Superior & Pitts., 17¼—17⅛; Majestic, 1⅝—1½; Raven, 1⅝—1¼; Shawmut, 1⅝—1¼; Superior Cop. 13; Troy, 3—2½.

BOSTON.

Adventure	7	6	6¾	2,132
Allouez	37½	35	35	820
American Zinc	9⅞	9⅞	9⅞	100
Atlantic	13½	12½	12⅝	1,230
Bingham	30¼	26½	28½	4,520
Boston Consolidated	28¼	24⅛	25	9,470
*Calumet & Arizona	112	108¾	109	629
*Calumet & Hecla	695	682	682	51
Centennial	22	20	20	2,265
*Copper Range	74¾	69	71¼	14,534
*Daly-West	16	15	15½	455
Franklin	18¼	17½	17⅞	2,975
Granby	12	10⅞	11	2,800
Greene Consolidated	25	23¾	24½	8,252
Isle Royal	18⅜	17½	18	1,188
Mass	7¾	7¼	7½	420
Michigan	11⅜	10⅜	11	530
Mohawk	64½	60⅜	61	1,524
Mont. Coal & Coke rcts.	2½	2½	2¼	165
Nevada	18¼	17¼	17⅜	1,110
*North Butte	88⅛	83⅛	85⅛	12,037
Old Dominion	40⅛	38	38½	993
Osceola	108½	106	108	5,120
*Parrot	27⅛	24	25¾	2,566
Quincy	95	93	93	70
Rhode Island	4⅝	4½	4⅝	545
Shannon	8¾	8	8⅜	7,055
Tamarack	95	95	95	152
Tecumseh	11½	9¾	10	2,463
Trinity	9	7¾	8¼	8,669
United Copper, com.	68	62	62⅞	12,350
U. S. Oil	11¼	10	10	2,320
U. S. Smg. & Ref.	57⅛	55	55⅞	4,821
U. S. Smg. & Ref., pfd.	47	46¼	46¼	2,218
Utah Copper	58⅛	53¾	54¼	7,150
Victoria	8¼	7½	8	925
Winona	6¼	6	6	585
Wolverine	138	137	138	171

PHILADELPHIA.

June 26.

Name of Company.	High	Low	Clg.	Sales.
American Cement	7⅝	7⅛	7⅛	1,386
Cambria Steel	36⅛	35¼	35¼	4,100
General Asphalt	39	39	39	
Penn. Steel, pd	107	106½	106½	120
Philadelphia Co	51	50½	51	362
Tonopah Mining	19	18⅝	18⅝	2,415

PITTSBURG.

June 26.

Crucible Steel	12	11¾	12	895
Crucible Steel, Pf.	77⅞	76¾	76¾	1,607
Harbison-Walker Ref.	10½	10⅛	10⅛	358
Ohio Tonopah	.31	.27	.28	3,270
Tonopah Ext	8	5½	5¾	11,155

Monthly Average Prices of Metals.

SILVER.

Month.	New York.		London.	
	1905.	1906.	1905.	1906.
January	60.690	65.288	27.930	30.113
February	61.023	66.10-	28.047	30.464
March	58.046	64.597	26.794	29.854
April	56.600	64.765	26.108	29.984
May	57.832	66.976	26.664	30.968
June	58.428	.....	26.910	.....
July	58.915	.....	27.163	.....
August	60.259	.. ..	27.822	.....
September	61.695	.....	28.528	.....
October	62.034	.....	28.637	.....
November	63.849	.....	29.493	.....
December	64.850	.....	29.977	.....
Year	60.352	.....	27.839	.....

The New York prices are in cents per fine ounce; the London quotation is in pence per standard ounce, .925 fine.

COPPER.

	NEW YORK.				LONDON.	
	Electrolytic.		Lake.			
	1905.	1906.	1905.	1906.	1905.	1906.
Jan.	15.008	18.310	15.128	18.416	68.262	78.896
Feb.	15.011	17.869	15.136	18.116	67.963	78.147
March	15.125	18.361	15.250	18.641	68.174	81.111
April	14.920	18.375	15.045	18.688	67.017	84.793
May	14.627	18.457	14.820	18.724	64.875	84.867
June	14.673	.....	14.813	.....	65.881	.....
July	14.888	.....	15.005	.....	66.887	.....
Aug.	15.664	.....	15.725	.....	69.830	.....
Sept.	15.965	.....	15.978	.....	69.667	.....
Oct.	16.279	.....	16.332	.....	71.406	.....
Nov.	16.599	.....	16.758	.....	74.727	.....
Dec.	18.328	.....	18.398	.....	78.993	.....
Year	15.590	.....	15.699	.....	69.465	.....

New York prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars. The London prices are in pounds sterling, per long ton of 2,240 lb., standard copper.

TIN IN NEW YORK.

Month.	1905.	1906.	Month.	1905.	1906.
Jan	29.325	36.390	July	31.760	.....
Feb	29.262	36.403	August	32.866	.....
March	29.523	36.662	Sept	32.095	.....
April	30.525	38.900	Oct	32.481	.....
May	30.049	43.313	Nov	33.443	.....
June	30.329	.....	Dec	35.835	.....
			Av. year.	31.358	.....

Prices are in cents per pound.

LEAD IN NEW YORK.

Month.	1905.	1906.	Month.	1905.	1906.
Jan	4.552	5.600	July	4.524	.....
Feb	4.450	5.464	Aug	4.665	.....
March	4 470	5.350	Sept	4.850	.....
April	4.500	5.404	Oct	4.850	.....
May	4.500	5.685	Nov	5.200	.....
June	4.500	.....	Dec	5.422	.....
			Av., year.	4.707	.....

Prices are in cents per pound. The London average for January, 1906, was £ 16.850 per long ton; February, £ 16.031; March, £ 15.922; April, £ 15.859; May, £ 16.725.

SPELTER.

Month.	New York.		St. Louis.		London.	
	1905.	1906.	1905.	1906.	1905.	1906.
Jan.	6.190	6.487	6.032	6.337	25.062	28.225
Feb.	6.139	6.075	5.989	5.924	24.594	25.844
Mar.	6.067	6.209	5.917	6.056	23.825	24.563
April	5.817	6.078	5.667	5.931	23.813	25.781
May	5.434	5.997	5.284	5.846	23.594	27.000
June	5.190	.....	5.040	.....	23.875	.....
July	5.396	.....	5.247	.....	23.938	.....
Aug.	5.706	.....	5.556	.....	24.675	.....
Sept.	5.887	.....	5.737	.....	26.375	.....
Oct.	6.087	.....	5.934	.....	28.225	.....
Nov.	6.145	.....	5.984	.....	28.500	.....
Dec.	6.522	.....	6.374	.....	28.719	.....
Year	5.882	.....	5.730	.....	25.433	.....

New York and St. Louis prices are in cents per pound. The London prices are in pounds sterling per long ton (2,240 lb.) good ordinary brands.

4324

GENERAL LIBRARY,
UNIV. OF MICH.
JUL 2 1906

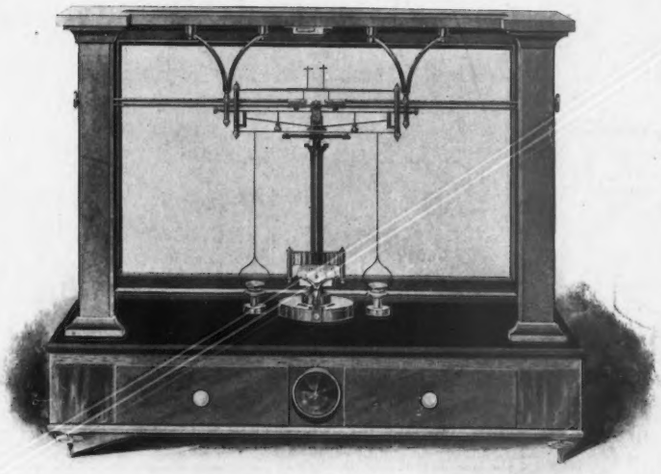
$5.00 PER YEAR. JUNE 30, 1906. Price 15 Cents.

THE ENGINEERING AND MINING JOURNAL

Vol. 81. 505 Pearl Street, New York. No. 26.

Contents, 1243. Index to Advertisers, 44 Buyers' Directory, 60. Professional Directory, 50.

AINSWORTH
PRECISION BALANCES



THE STANDARD FOR
DESIGN, ACCURACY, WORKMANSHIP AND FINISH

Made in the Finest Equipped Factory for the Manufacture of

Balances and Weights of Precision
IN THE WORLD

ANNUAL OUTPUT 1000

Catalog A-8 giving full information and prices will be sent on request by

WM. AINSWORTH & SONS
DENVER, COLO., U. S. A.

The phenomenal demand for our Transits has necessitated an increase in floor space of 200% in this department. Bulletin BX-8 describes this line.

Sole Manufacturers of
The Brunton Patent Pocket Transit.

CYANIDE PLANT EQUIPMENT

We Furnish everything neccessary for the complete equipment of Cyanide Plants. Supplies

Tanks for all purpose. Our Tanks are made from The Famous California Redwood

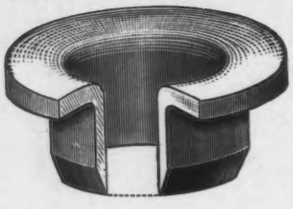
REDWOOD MANUFACTURERS CO.
First and Alice Sts.,
Oakland, Cal.

Our Factory Was Not Damaged By The Great Earthquake and Fire

Send for Catalogues

Send for Catalogues

WEARWELL LEATHER PACKING



Try Them

Made from the finest grade of oak tanned leather for any make of Air Drill.

They Fit and Wear

Write for illustrated booklet and samples.

Detroit Leather Specialty Co.
Manufacturers
15 Beecher Ave., Detroit, Mich.

ILLINOIS ZINC COMPANY

Manufacturers of

Spelter, Sheet Zinc, Sulphuric Acid, and Acid Phosphate

PERU, ILLINOIS

W. FISHER, Agent,

81 and 83 Fulton Street, New York City, Telephone 139 John.

WE MAKE
CYPRESS TANKS FOR ALL MINING AND BREWING PURPOSES
OIL STORAGE TANKS Write for Catalogue.
H. F. LEWIS & CO., Ltd., 316 Baronne Street, New Orleans, La., U. S. A.
Cable Address: "Lewistank," W. U. Code.

The Vanadium Alloys Company
25 BROAD STREET, NEW YORK
Producers and Sellers of
Ferro-Vanadium 25%-50% Vanadate of Iron 50%-75%

For Perfect Control

Our Hoisting and Haulage Engines can not be surpassed. This is one of the most important features that such an engine should possess and we KNOW, therefore, that our engines will supply your needs better than any others on the market. Our engines are liked by the MEN WHO RUN THEM because they are so delicate of control and accessible for cleaning and keeping in repair. **Send for Catalogue No. 15.**

The Aetna Foundry & Machine Co.
Springfield, Ill., U. S. A.

MILWAUKEE BRIDGE CO.,

Engineers, Contractors, Manufacturers

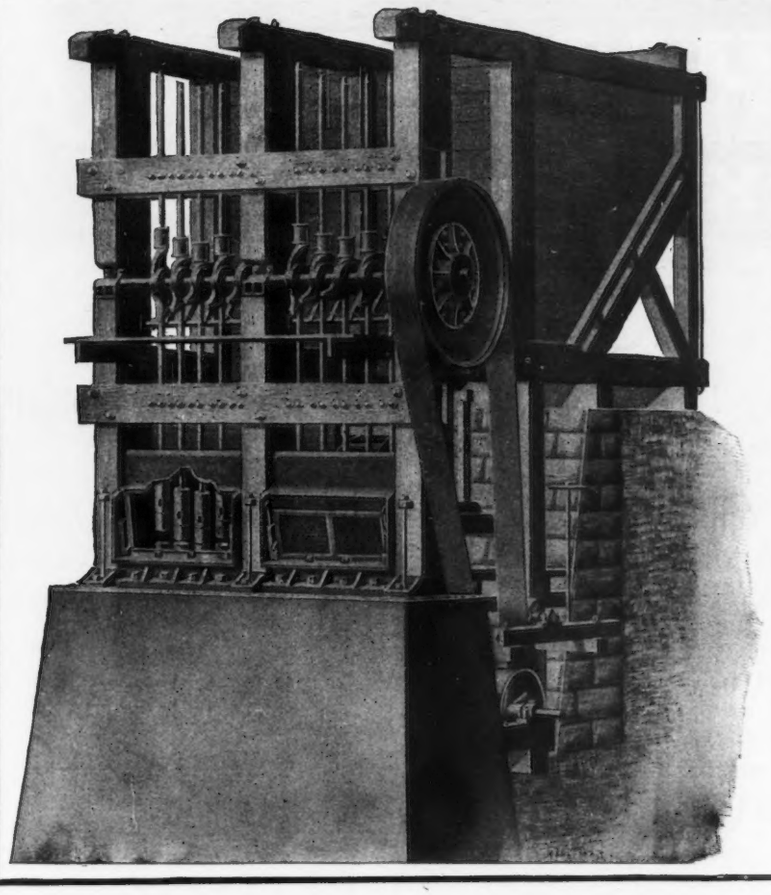
STEEL FRAMED STRUCTURES OF ALL KINDS.

Mining and Mill Buildings.

COAL HANDLING EQUIPMENT.

Main Office and Works,

34th Street, - Milwaukee, Wis.



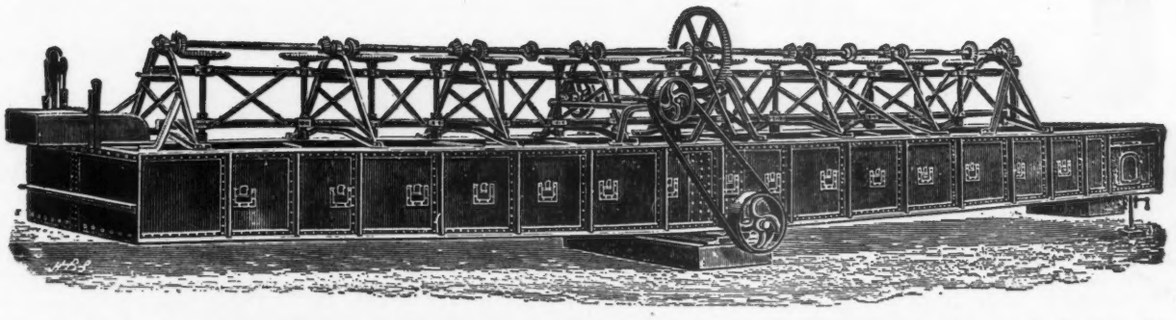
This cut shows the most perfect and most enduring construction for heavy Stamp Batteries. The mortars, specially designed, rest directly on a solid concrete foundation; the battery posts being securely held by cast iron shoes bolted to the solid foundation.
SOLID, PERMANENT.

CHALMERS
&
WILLIAMS
MINING MACHINERY
Office: Chicago, 1553 Railway Exchange
Works: Chicago Heights
Dooly Block, Salt Lake City

SALES AGENTS FOR
GREEN ROTARY PRESSURE BLOWERS.

THE "EDWARDS" PATENT

MECHANICAL ORE-ROASTING FURNACES



Unrivalled, simple, efficient. Acme of economy in maintenance, labor and fuel. No chains or drags. **There is no other just as good.** Investigate the saving in labor, fuel and maintenance charges over any other furnace.

Write for Circular and Information to

CHISHOLM, MATTHEW & CO., COLORADO SPRINGS, COLO., AGENTS.

T. EDWARDS, Ballarat, Australia, Patentee and Owner.

ALLIS-CHALMERS CO
MILWAUKEE WIS U S A

COPPER CONVERTERS.

We Are Prepared to Offer Any Type Desired, Either Electrically or Hydraulically Operated, Especially Adapted to the Service for which it is Required.

Since the Bessemerizing of Copper Mattes was First Practiced in the United States, Over a Score of Years Ago, We Have Kept Pace with Every Development in Roasting, Smelting and Refining, Having Equipped Many of the Largest Plants in the World. Our Best Known Type of Hydraulically Turned Converter is Illustrated Herewith.

WE FURNISH COMPLETE EQUIPMENTS FOR ROASTING, SMELTING AND REFINING

Including Blowers; Blowing Engines; Allis-Chalmers Bruckner, McDougall and White-Howell Furnaces; Tilting Reverberatory Furnaces; Reverberatory Roasting Furnaces; Reverberatory Smelting and Refining Furnaces; Muffle Furnaces; Elliptical, Rectangular or Round Water-Jacketed Copper Matting Furnaces; Welded or Riveted Steel Water Jackets for Copper Furnaces; Single or Double English Cupelling Furnaces; Accumulators; Pressure Tanks and Pumps; Pouring Spoons; Matte Ladles; Settling Pots; Slag Cars; Slag Pots; Transfer Cars and Turntables; Sampling Outfits; Stamp Batteries; Breakers; Crushers and Reduction Machinery of Every Description. Pumps Steam and Electrically Driven. Hoisting Machinery. Steam and Gas Engines; Steam and Hydraulic Turbines; Generators; Motors and Electrical Apparatus of All Kinds.

DISTRICT OFFICES

ATLANTA, Ga., Fourth Nat'l Bank Bldg.
BALTIMORE, Md., Continental Bldg.
BOSTON, Mass., State Mutual Bldg.
BUFFALO, N. Y., Ellicott Square Bldg.
BUTTE, Mont., 51 East Broadway.
CHICAGO, Ill., First Nat'l Bank Bldg
CINCINNATI, O., First Nat'l Bank Bldg.
CLEVELAND, O., New England Bldg.
DALLAS, Texas, Wilson Building.
DEADWOOD, S. D.
DENVER, Colo., 1651 Tremont St.
DETROIT, Mich., 800 Union Trust Bldg.
EL PASO, Texas, Orndorff Hotel Bldg.
KANSAS CITY, Mo., The Dwight Bldg., corner Baltimore Ave. and Tenth St.
MINNEAPOLIS, Minn., Corn Ex. Bldg.
NEW YORK, 71 Broadway.
OMAHA, Neb., 537 Range Bldg.
PHILADELPHIA, Pa., Land Title Bldg.
PITTSBURG, Pa., Frick Bldg.
ST. LOUIS, Mo., Chemical Bldg.
SALT LAKE CITY, Utah, Dooly Bldg., 117-119 West 2nd South St.
SAN FRANCISCO OFFICE, 906 Broadway, Oakland, Cal.
SEATTLE, Wash., 316 Occidental Ave.
SCRANTON, Pa.

FOREIGN SALES OFFICES

LONDON, - - - - 533 Salisbury House, Finsbury Circus, E. C.
JOHANNESBURG, South Africa, - - - - The Corner House

FOREIGN SALES AGENCIES

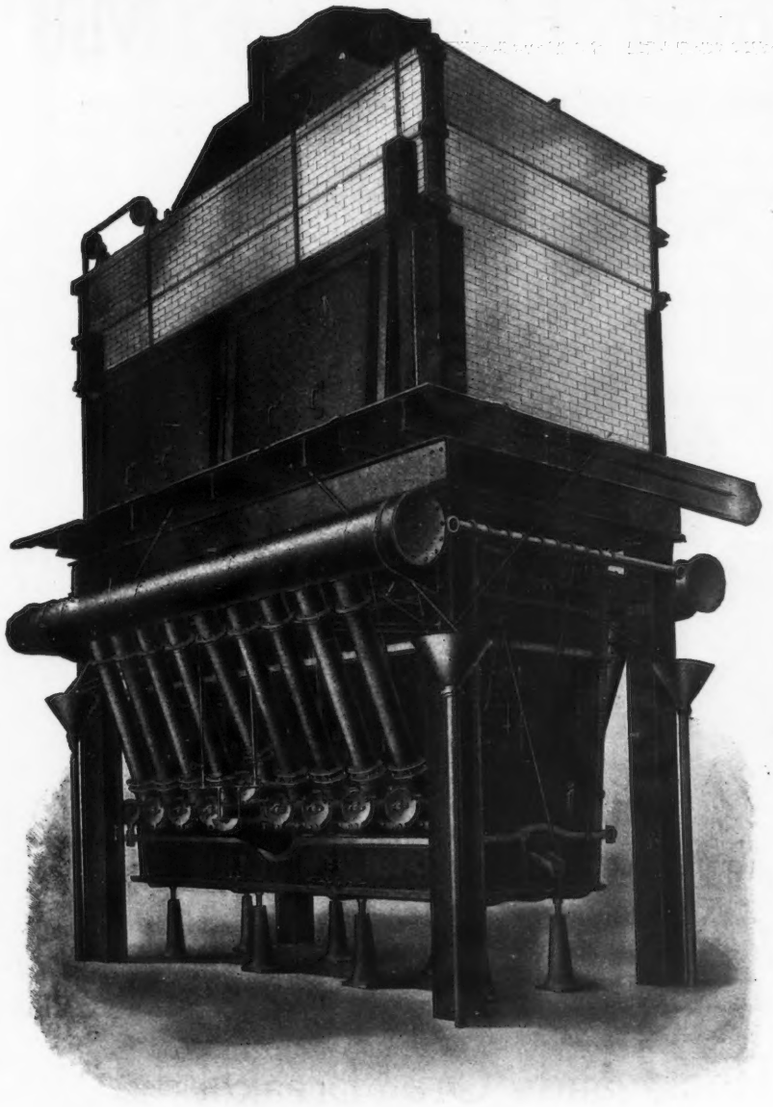
AUCKLAND, New Zealand, - - - John Chambers & Son, Ltd.
BUENOS AIRES, - - - - - - Donnell & Palmer
CONSTANTINOPLE, Turkey, - - - - - J. G. Johnson & Co.
JOHANNESBURG, South Africa, Herbert Ainsworth (for Rock Crushers only)
LIMA, Peru, - - - - - - - Henry Guyer
MANILA, P. I. - - - - - - - Bryan-Landon Co.
MELBOURNE, Australia, - - - Knox, Schlapp & Co., Propy. Ltd.
PERTH, West Australia, - - - - - Frank R. Perrot
VALPARAISO, Chile, - - - - - John R. Beaver
YOKOHAMA and KOBE, Japan, - - The American Trading Company
SHANGHAI, China, - - - - " " " "

Canadian Representatives, Allis-Chalmers-Bullock, Ltd., Montreal.

THE WELLMAN-SEAVER-MORGAN CO.

WELLMAN-SEAVER-MORGAN ENGINEERING DIVISION — ENGINEERS AND MANUFACTURERS — WEBSTER, CAMP & LANE DIVISION

SMELTING EQUIPMENT



COPPER SMELTING FURNACE

ENGINEERING WORK

We are Consulting Engineers, in general practice, with exceptional facilities for handling important work, from complete plants to individual pieces of equipment. Our services are available as Engineers, Designers or Manufacturers and we are prepared to take complete charge of work from start to finish, turning it over ready for operation.

MANUFACTURING WORK

We build an extensive line of equipment to meet the varied conditions and requirements of different plants. Our work includes:

EQUIPMENT BUILT

Mining, Milling, Smelting
Ore and Coal Handling
Blast Furnace and Steel Works
Hoists and Haulages,—
Steam, Electric
Headframes, Tipples, Cages, etc.
Hoisting and Conveying
Cranes,—
Traveling, Locomotive, Gantry, etc.
Car Dumpers
Buckets,—
Grab, Excavating, etc.
Engines,—
Steam, Gas.
Water Power Equipment
Gas Producers
Coke Oven Machinery
Gun Carriages
Railway Specialties
Steel Castings

SPECIAL EQUIPMENT DESIGNED AND BUILT

Write for Booklet:
"What We Do."

COMPLETE PLANTS DESIGNED AND EQUIPPED

GENERAL OFFICES: CLEVELAND OHIO, U. S. A.

BRANCH OFFICES: New York: 42 Broadway. Chicago: 1325 First National Bank Building.
Pacific Coast Office: Temporary Address, 220 Twelfth St., Oakland, Cal.
London, Eng., 47 Victoria St., S. W.

SELLING AGENTS: Denver: Hendrie & Bolthoff Mfg. & Supply Co. City of Mexico: Victor M. Braschi & Co.

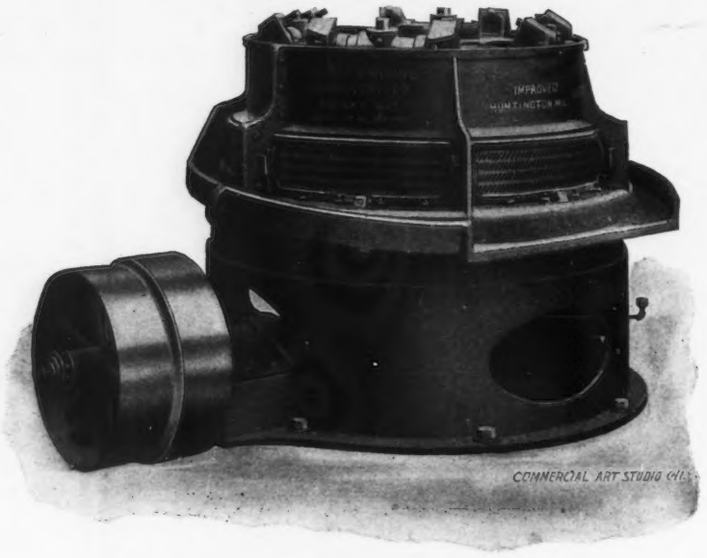
POWER AND MINING MACHINERY COMPANY

Our Improved Huntington Mill

is the only one built with an iron base.

This makes the machine self-contained and readily accessible, prevents vibrations and greatly increases the capacity.

(Send for Bulletin No. 27.)



Perfect Alignment

Small Power Required

Complete Equipments for

Mining, Milling and Smelting

Sole Builders of the Famous

McCully Rock and Ore Breakers

Cement Machinery.
Loomis-Pettibone Gas Generating Plants
American-Crossley Suction Gas Plants and Gas Engines

SALES OFFICES
Atlanta, Ga., 1333 Candler Building.
Boston, Mass., State Mutual Building.
Chicago, Ill., First National Bank Building.
Columbus, O., 700 Columbus Savings & Trust Building.

Works and Office
Cudahy, Wis.
Suburb of Milwaukee

SALES OFFICES
Denver, Colo., 312 - 17th Street.
Salt Lake City, Utah, Commercial Club Building.
El Paso, Texas.

NEW YORK CITY OFFICE - - 52 WILLIAM STREET

COAL CUTTERS

JEFFREY

ROCK DRILLS

Jeffrey 10-Ton Single End Control Electric Locomotives in Operation at Pittsburgh Gas Coal Company's Mine, Iselin, Pa.

JEFFREY LOCOMOTIVES

HAUL THE WORLD'S COAL

Catalogues Free

THE JEFFREY MFG. COMPANY

COLUMBUS, OHIO, U. S. A.

New York
Pittsburgh

Chicago
Denver
Boston

Charleston, W. Va.
Knoxville, Tenn.

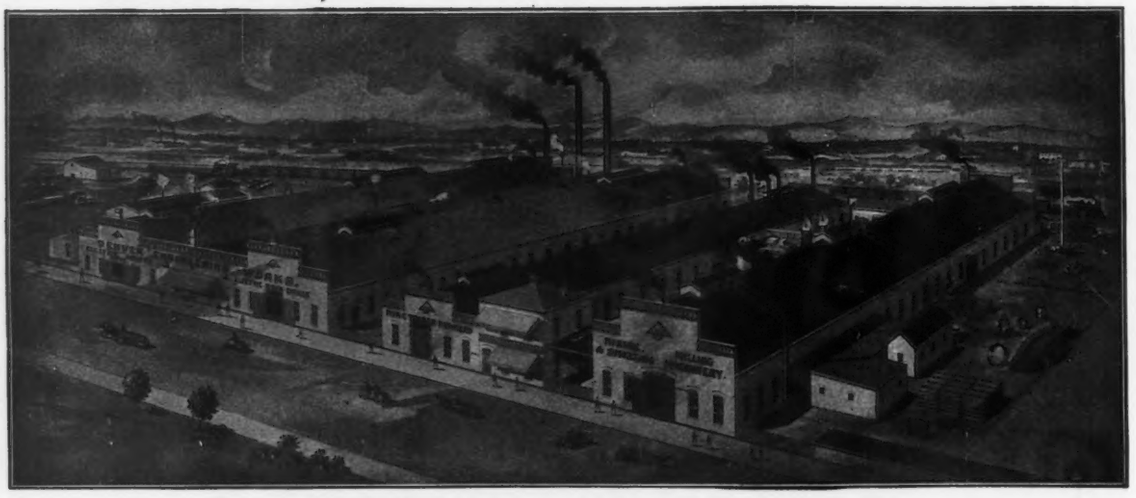
POWER TRANSMISSION

MACHINERY

ELEVATING CONVEYING

The Denver Engineering Works Co.

Denver, Colorado, U. S. A.



MANUFACTURERS OF

Electric Hoists.

Complete standard line of Hoists of any capacity and any power circuit; single or double drum; sizes ½ to 3,000 H. P. In use in the principal mines of the United States, Canada and Mexico.

Crushing Rolls, without Springs.

Rolls with rigid bearings give absolutely uniform product; no over-size; very simple, strong, and low-priced.

Mine Timber Framing Machines.

Frame round or square timbers to uniform length and required shape, ready to go into place. Will do the work of 20 carpenters in one-tenth the time, and will do it right. Only standard machine made.

Stamp Mills.

We are now building the largest Stamp Mill in Colorado, comprising all steel buildings, and a two-mile wire rope tram, with steel terminal buildings. All machinery driven by electric motors.

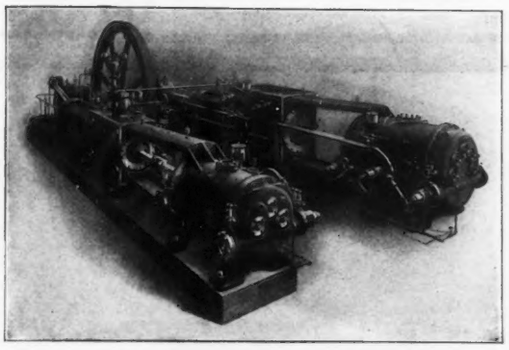
Smelting Furnaces.

Silver-Lead and Copper Furnaces. All complications eliminated. Some of our furnaces have record of 19 months' continuous operation without shut-down.

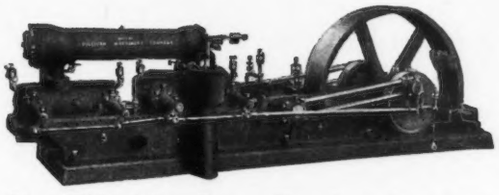
Tube Mills.

The modern machine for fine grinding. We furnished and installed the first Tube Mills in Colorado.

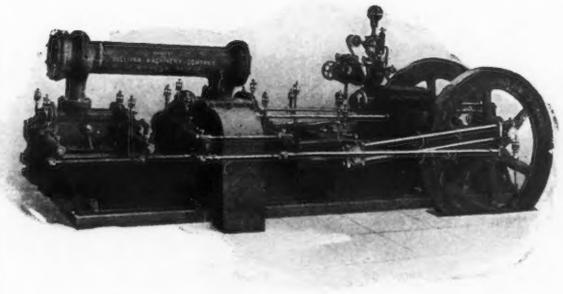
Air Compressors for Mining Service



Class W X Two-Stage Corliss Cross Compound Type.



Class W H-2 Belt-Driven Two-Stage Type, with Unloading Valve.



Class W B-2 Standard Two-Stage Straight Line Type, Steam Driven.

Sullivan Compressors are built upon the two-stage principle (excepting only the smallest sizes), thus securing a power economy of 10 to 15 per cent. in the air end, over simple compression.

Superior efficiency is further gained:

By supplying cool dry air to the compressor from outside the engine house.

By admitting this air to the cylinders through wide, direct passages and quick acting Corliss inlet valves, of large area, securing high volumetric efficiency.

By exceptionally thorough cylinder water jackets and large intercooling area.

By self-acting poppet discharge valves, so placed as to reduce clearance to the minimum and easily removable, with their seats, for inspection or cleaning.

Details worth investigating are described in Catalog 53.

Rock Drills, Diamond Drills, Hoists
...Coal Cutters...

SULLIVAN MACHINERY CO.

Claremont, N. H.
New York
Pittsburg
Knoxville

St. Louis
Joplin, Mo.
Denver
Butte

Railway Exchange
Chicago, Ill.

El Paso
Salt Lake
Paris, France
Johannesburg

*San Francisco
Rossland
Spokane
Mexico

* Temporary address: 1010 Washington St., Oakland, Cal.

TRAYLOR ENGINEERING CO.

Consulting, Mechanical and Metallurgical Engineers. Manufacturers of Silver-Lead, Copper and Iron Smelting Furnaces, Concentrating, Amalgamating, Cyaniding, Rock-breaking and Cement-making Machinery.
Centripact Screens.

VICTOR M. BRASCHI & CO.,
Mexican Representatives of the Traylor Engineering Co.

We announce with pleasure that Victor M. Braschi & Co., of the City of Mexico, have become the exclusive representatives for the sale of our products in Mexico. These products include Machinery for MINING, SAMPLING, ROCK CRUSHING, MILLING, CONCENTRATING, AMALGAMATING, CYANIDING, SMELTING, REFINING, FUEL BRIQUETTING and CEMENT MAKING.

They will carry a large assortment of our machinery in stock.

Their Engineers will co-operate with us in designing mining and metallurgical plants for our patrons. All persons who are ready to do business are urged to apply to them for plans and estimates or for any engineering help.

The high reputation of Victor M. Braschi & Co. is well known. The firm represents such houses as the Ingersoll-Rand Co., the A. S. Cameron Steam Pump Works, and the Erie City Iron Works. Mr. Braschi is a graduate of the Columbia School of Mines (1881). He is assisted by a large corps of able engineers. Our friends can be sure of receiving from them skillful and satisfactory service.

We desire to also call attention to the advantages we possess over all rivals in manufacturing and shipping facilities at our new works at Allentown, Pa. The works are in a district noted for its supplies of raw and manufactured material and are direct-connected with all the trunk line railroads. We can place machinery f. o. b. at the seaboard cheaper than if our works were in New York City.

TRAYLOR ENGINEERING COMPANY.

114 LIBERTY STREET -- NEW YORK CITY, N. Y.

MURPHY AIR HAMMER ROCK DRILLS.

Murphy Drill, with Automatic Feed Connection, Putting in Upper.

Developed and built by practical miners.
For speed of drilling, simplicity, durability, these Drills are unequaled
Minimum cost for repairs.
Minimum amount of air consumed for work accomplished.

We guarantee them. *Write for catalog.*

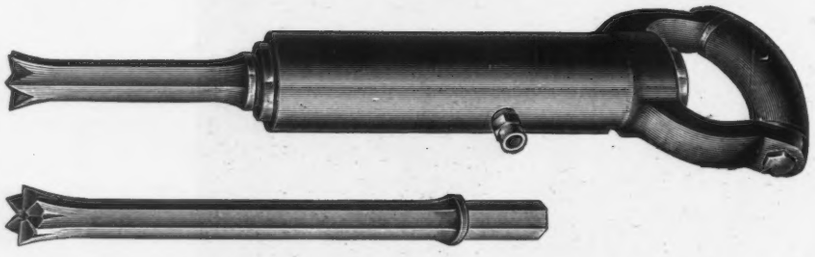
C. T. CARNAHAN MFG. CO.,

36th and Wazee Sts., Denver, Colo.

REPRESENTATIVES—George R. Smith, 161 Main St., Salt Lake City, Utah. Joshua Hendy Machine Works, 38-44 Fremont St., San Francisco. J. H. Prescott, 707 Lincoln Trust Bldg., St. Louis, Mo., Agt. S. E. States. Bradley Engineering & Machinery Co., Spokane, Wash. Australian Metal Co., Ltd., Melbourne, Australia. Mine & Smelter Supply Co., El Paso, Tex.

HARDSOCG

WONDER
AIR HAMMER ROCK DRILLS.



Save—
Money
Time
Labor
Air

THOROUGHLY PRACTICAL ONE MAN PNEUMATIC DRILLS.
18 lb. HAND DRILLS FOR GENERAL PURPOSES.
30 lb. HAND DRILLS FOR SHAFT SINKING AND GENERAL PURPOSES.
MOUNTED DRILLS FOR TUNNELING AND UPRAISING.
SUCCESSFUL AIR FEED ATTACHMENT SUPPLIED WHEN DESIRED.

DRILL RAPIDLY. **ECONOMICAL.**
EASILY OPERATED. **CONVENIENT.**

Drill A 4 Ft. Air-Cleaned Hole In Any Direction.

Only 4 Parts And But 1 Of Them Movable. Nothing Complicated.
Enables The Placing Of Blasts To The Best Advantage.

WONDER HEXAGON ALL-STEEL HOLLOW BITS ARE MADE OF THE BEST MATERIAL.
THEY FIT ALL WONDER DRILLS AND DO FINE WORK.

Every Machine Is Fully Guaranteed.

Pleased Mine Operators And Quarrymen Testify To The Success Of WONDER DRILLS AND BITS.

Write For Descriptive Catalog.

Wonder Drill Co.

OTTUMWA IOWA U. S. A.

STANDARD FOR

COAL MINING

THE "NEW INGERSOLL"

"The Hard Hitting Puncher," with a greater cutting capacity than any other pick machine—Increases the percentage of lump and reduces mining costs—Economical of air and low in operating costs — Economical of repairs and low in maintenance costs—In six sizes adapted to every mining condition.

Catalog No. 52

"New Ingersoll" in the National Coal and Iron Co.'s Mine, Straight Creek, Ky.

Shearing with the "Radialaxe."

THE "RADIALAXE"

The only successful shearing and entry-driving machine—Mounted radially and mechanically directed, cuts 8 x 12 feet at a single setting—Made in three sizes for different conditions—Economical in operation and up-keep—Drives a heading in development twice as fast as any other machine—Pamphlet No. 353.

AIR COMPRESSORS ROCK DRILLS
CALYX CORE DRILLS PNEUMATIC PUMPS

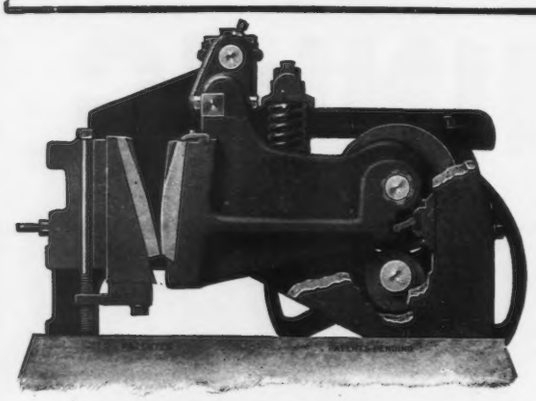
INGERSOLL-RAND CO.

11 BROADWAY, **NEW YORK.**

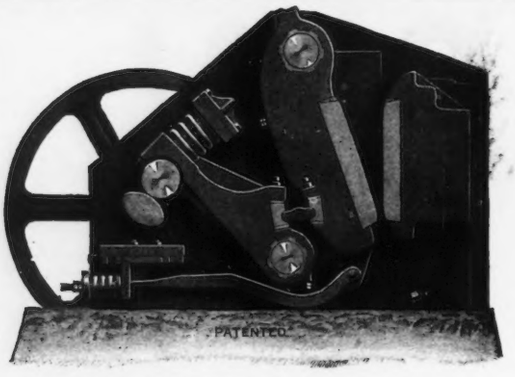
Pittsburg, Philadelphia, St. Louis, El Paso,
Chicago, Houghton, Mich. Cleveland, Boston.

E 67

Rock and Ore Crushing and Grinding Machinery



Roll Jaw Fine Crusher.



11 x 26 Steel Ore Breaker.

Ore Breakers
Fine Crushers
Roughing and Finishing Rolls
Huntington and Chilian Grinding Mills
Screens, etc.

Only the best Machinery for

All kinds of work

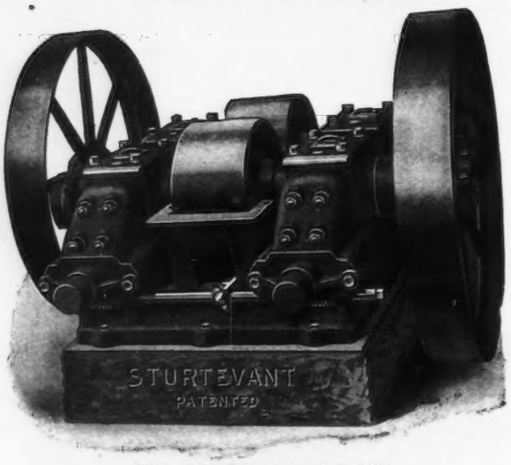
We offer for your selection the

Largest Variety of Standard Machines and Specialties built.

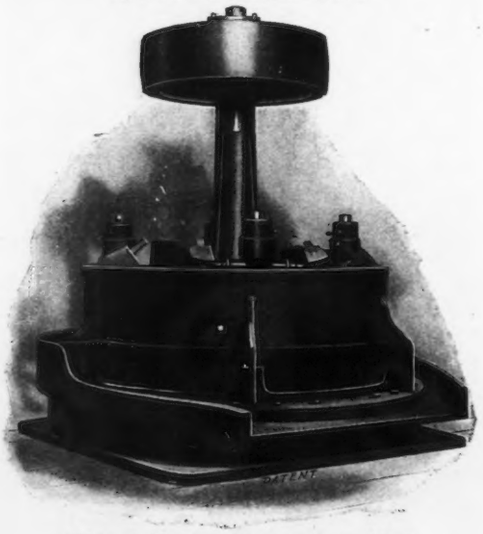
Ten Kinds of Crushers alone

Five Kinds of Grinders, etc.

Send for our 1906 Catalogue just issued



32 x 16 Balanced Rolls.



Direct Drive Huntington Mill.

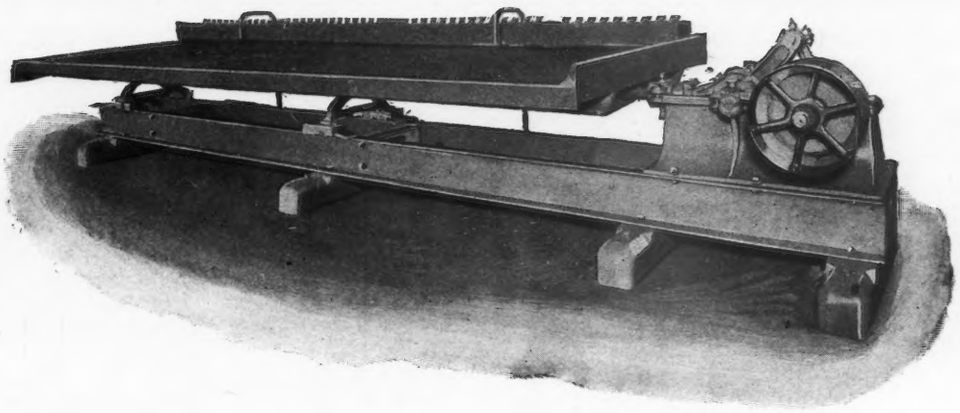
Sturtevant Mill Company, 110 Clayton St., BOSTON, MASS.
Harron, Rickard & McCone, Coast Agents, San Francisco, Cal.

JIGS
MAGNETS
SEPARATORS
COAL WASHING
MACHINERY

AMERICAN CONCENTRATOR CO.
NEW CENTURY
JOPLIN, MO., U.S.A.

CRUSHERS
ROLLS
ORE FEEDERS
DISINTEGRATING
GRIZZLEY MACHINES

Ford New Century Table.



It embodies every up-to-date idea required in an ideal machine.

Simplicity.

Perfect adjustment.

Delicate stratifying effect.

Large capacity.

Cleanest concentrates.

Leanest tails.

It could not be better built if we charged you twice the price.

In order to quickly introduce them into every concentrating camp where the Journal is read, we will make this matter of price of especial interest to you. Write us. It runs like a watch.

JIGS
MAGNETS
SEPARATORS
COAL WASHING
MACHINERY

AMERICAN CONCENTRATOR CO.
NEW CENTURY
JOPLIN, MO., U.S.A.

CRUSHERS
ROLLS
ORE FEEDERS
DISINTEGRATING
GRIZZLEY MACHINES

THERE'S ONLY NEW STANDARD 800 NOW UNSOLD CONCENTRATORS

AND ONLY ONE MONTH AGO WE PUT 1000 ON THE MARKET

THE WORLD KNOWS WE HAVE NEVER BEEN BEATEN IN ANY TEST, WHEREVER THE TEST WAS MADE

AND WE STILL INVITE TESTS FROM ALL OVER THE COUNTRY

NOW OUR BUSINESS IS SOLELY TO SAVE YOU THE MIDDLE MAN'S PROFIT IN THIS DEAL

These machines are the **1906 Model,** embracing all the latest improvements and best workmanship. We are enabled to make this reduction by dealing directly with the user, thus being relieved of commissions, etc., formerly paid agents and middle men.

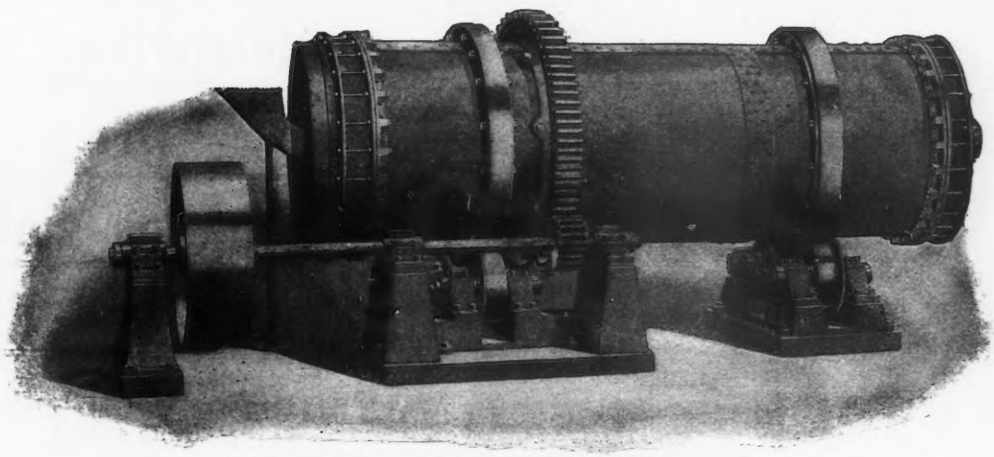
Send for catalog and treatise on concentration. Let us tell you about the Dimmick Tangential Sizing Launder and help you save all your values.

P. B. McCabe & Co., Selling Agents,

LOS ANGELES, CALIFORNIA, U. S. A.

Llewellyn Iron Works, Sole Manufacturer, Los Angeles, Cal.

ABBÉ ENGINEERING COMPANY



Copyright, 1904, by Abbé Engineering Co., Patented Nov. 17, 1903.

Abbé Tube Mills

Essential Features:

Require less power than all others.

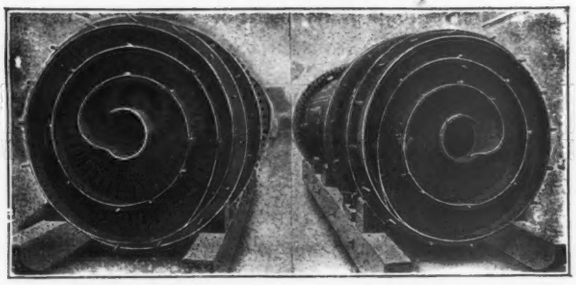
Slow Running. Large Capacity

Suitable for all purposes when uniform and fine pulverization is desired, especially adapted to the Reduction of Ores, Cement, Chemicals, Talc, etc.

GRIND WET OR DRY EQUALLY WELL.

"Improvement the Order of the Age"

An improvement in the Abbé Tube Mill, which should appeal to all interested in the problem of fine grinding, and which makes it the ONLY PERFECT TUBE MILL



Does away with conveyors and stuffing boxes, used in ordinary tube mills, and overcomes trouble caused by clogging and breaking down, saving time and expense of repairs

Copyright, 1904, by Abbé Engineering Co., Patented 1903.

The "IDEAL" SPIRAL FEED AND DISCHARGE

Send for our 80-page Illustrated Catalog, showing the full line of machines we build.

ABBÉ ENGINEERING CO.

218-220 Broadway, New York City

STEARNS-ROGER MFG. CO., Denver, Colo., West'n Representatives and Manufacturers

Opal Wood.

Crystals, Fine Mineral Specimens, Meteorites, Rare Ore Samples, Colored Stones, Etc.

If you wish to SELL, mail samples with offer.

If you wish to BUY, send for our free illustrated catalog, stating whether a collection or single specimens are desired.

Collections of Minerals.

Sets of Ores.

FOR 30 YEARS we have been supplying reference specimens to the mining schools, universities and museums throughout the world. We refer to any curator or professor of mineralogy or geology.

OUR LABELS accompany every specimen, giving correctly name, chemical composition and locality.

QUALITY IS GUARANTEED in our prepayment of transportation to any address in the world (on orders of $20 or more). We could not take this transportation risk if the quality did not insure your keeping them, as we refund money on minerals promptly returned.

PRICES are the lowest as comparison will show. The volume of our trade permits it.

Prospector's Collection No. 27 B. 200 specimens 2¾ x 2 inches, includes ores of Gold [9], Silver [13], Platinum [2], Iridosmine [1], Iron [25], Lead [9], Antimony [6], Zinc [9], Copper [25], Lithium [3], Barium [3], Carbon [7], Nickel [7], Cobalt [4], Manganese [7], Aluminum [6], Radium and Uranium [10], Thorium [3], Yttrium [5], Cerium [5], Tin [4], Tungsten [3], Titanium [3], Molybdenum [2], Vanadium [2], Tantalum [2], Arsenic [4], Mercury [2], Bismuth [3], Miscellaneous [16]. Price $90, delivered to any address in the world. Oak drawer cabinet, $9.00 extra.

Illustrated Catalogs Free.

Rare Ores Bought in Ton Lots.

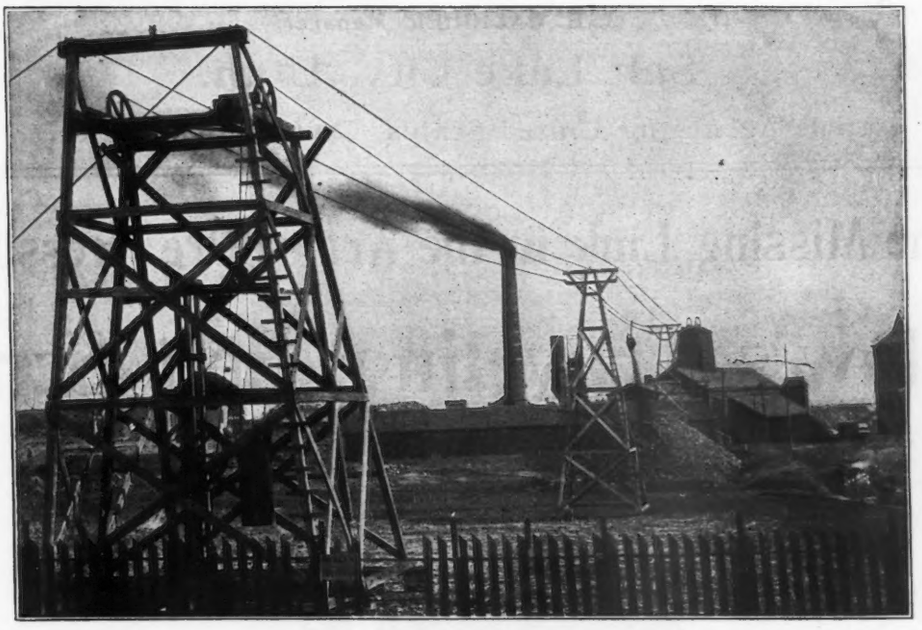
Correspondence solicited with miners or consumers of the ores of

Tantalum, Titanium, Uranium, Zirconium, Molybdenum, Thorium, etc., etc.

ADDRESS DEPT. A,

Foote Mineral Company, 1317 Arch St., Philadelphia, Pa., U.S.A.

ESTABLISHED 1876.



OUR

Aerial Wire Rope Tramways

HAVE

A special patent clip which is attached to the rope and will not slip under any conditions. This clip rides in the grooves of the guide sheaves, the flange and groove of which are made to exactly fit the clip. In other words the traction rope is always carried at the same distance from the standing cable whether the bucket has passed over the tower or not, thereby increasing the life of the rope.

Write us and we will tell you other points of where our tramways excel.

Write us about our "POWERSTEEL" Rope, the **only** wire rope to receive the highest award at two Expositions.

MANUFACTURED BY

Broderick & Bascom Rope Co.

St. Louis, Mo.

19 Murray St., New York - Seattle, Wash.

The Utah Mining Machinery & Supply Co.

J. E. GALIGHER, Manager.

Salt Lake City, Utah.

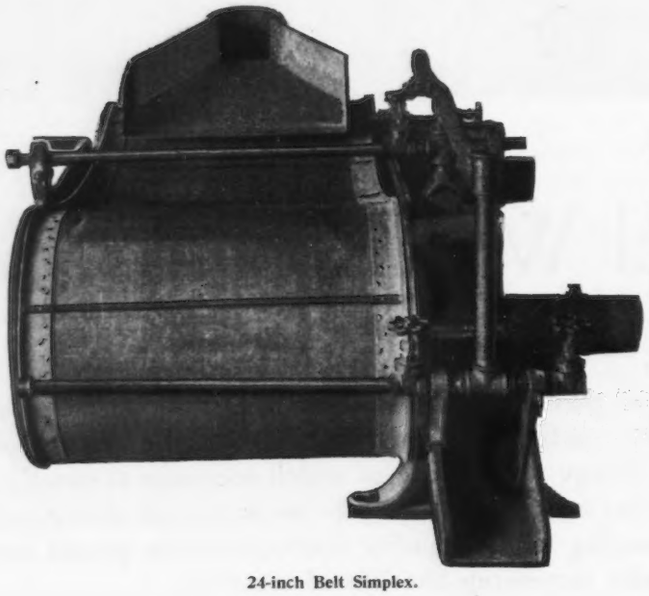
Sole Agents for United States, Canada and Mexico.

The Missing Link in the Art of Ore Dressing.

Callow's Traveling Belt Screen

for Perfect Sizing of Finely Crushed Material.

A special feature of this machine is that by the addition of the necessary extra rollers, shafts, belts, etc., weighing 650 lbs. and costing $150, it can be converted into a Duplex, thus doubling the capacity.



24-inch Belt Simplex.

No Shake.

No Noise.

No Bump.

Price $450.00.

Weight 1,250 lbs.

The above Simplex machine has a capacity of 50 tons per day to 80 mesh, or 100 tons per day to 30 mesh.

Actual practice has proved that jigs and tables have an immensely increased capacity when treating the perfectly sized feed supplied to them by the use of this screen.

Send for Bulletin No. 200 and insert sheets.

Foreign Agents: FRASER & CHALMERS, London.

Baldwin Locomotive Works

Burnham, Williams & Co., Philadelphia, Pa., U. S. A.

Steam
Compressed
Air
and Electric

Baldwin Compressed Air Mine Locomotive

Locomotives For **Mines and Furnaces**

Flexible Steel-Armored Hose

Far Superior to Any Other Make of Hose for Steam or Compressed-Air Service

The remarkable qualities of this armored hose have made all users enthusiastic over it. The nature of the armor affords great flexibility without exposing any part of the rubber lining to external injury and makes the hose absolutely reliable, for even after the rubber lining becomes useless the armor is sufficiently tight to prevent any serious leakage of steam or air. The work in progress can thus be continued until it is convenient to replace the damaged hose with a new piece. This has been demonstrated in actual service and is something that has heretofore been impossible with any other make of hose.

The strength and durability of the Flexible Steel-Armored Hose are vastly greater than those of any other hose on the market.

Write for copy of descriptive bulletin No. 50532.

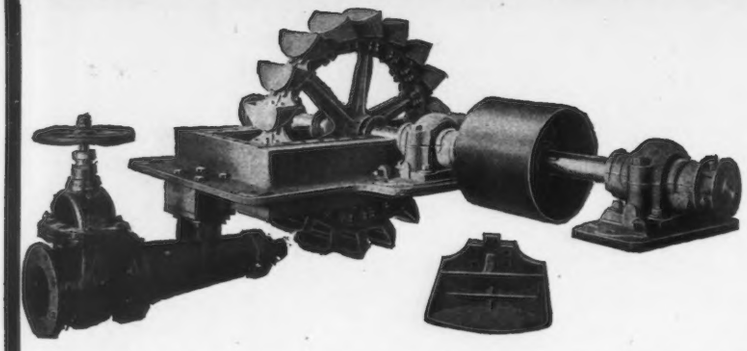
Sprague Electric Company

General Offices: 527-531 West 34th Street, New York City

THE LARGEST MINING MACHINERY HOUSE IN THE WORLD

THE MINE & SMELTER SUPPLY Co

SOLE OWNERS AND MANUFACTURERS OF THE WILFLEY CONCENTRATING TABLE AND SLIME TABLE



DE REMER WATER WHEEL

The Horizontal Splitters distinguish the De Remer from all other forms of tangential impact water wheels.

We guarantee this wheel to have 15 per cent. higher efficiency than any type of turbine water wheel and 10 per cent. higher efficiency than any other type of tangential wheel.

In tangential water wheels, the effective dynamic pressure in causing rotation is that which is tangential to the circumference of revolution. The arrangement of the Splitters in the De Remer bucket is such that the force of impact of the water is tangent to the circumference of the wheel and a maximum efficiency results. No other wheel is so constructed, hence no other wheel is so efficient.

We furnish Complete Power and Hydro-Electric Equipments.

DENVER
EL PASO

42 BROADWAY
NEW YORK CITY

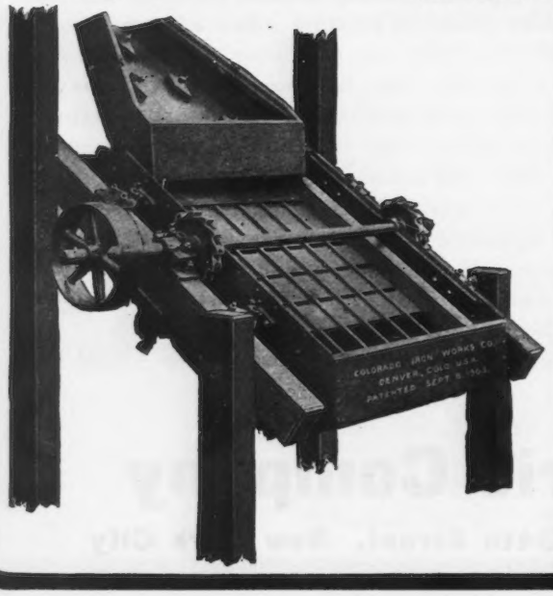
SALT LAKE CITY
CITY OF MEXICO

COLORADO IRON WORKS COMPANY

ORE SMELTING EQUIPMENTS

ORE MILLING MACHINERY

1860 DENVER, COLORADO, U. S. A. 1906



C. I. W. Impact Screen

For

Screening and Sizing Wet or Dry Ores.

Superior Capacity—
The Impact Screen, with only 9 square feet of screen cloth, is equal in capacity to a trommel having 66 square feet of screen surface.

Has a Vertical Vibratory Motion,
which prevents the particles of ore from clogging the meshes, whether in wet or dry work.

Adapted to Fine Screening—
It handles the fines as efficiently as it does the coarse. It is well suited to sizing in place of hydraulic sizers.

Your Mill Capacity depends upon your Screen Capacity.

Colorado Iron Works Company,
Denver, Colo., U. S. A.

Clement & Strange, Representatives, 307 Dooly Blk., Salt Lake City, Utah.

THE PIONEER MINING MACHINERY HOUSE OF THE WEST.

THE HENDRIE & BOLTHOFF MFG. AND SUPPLY CO.

DENVER, COLO.

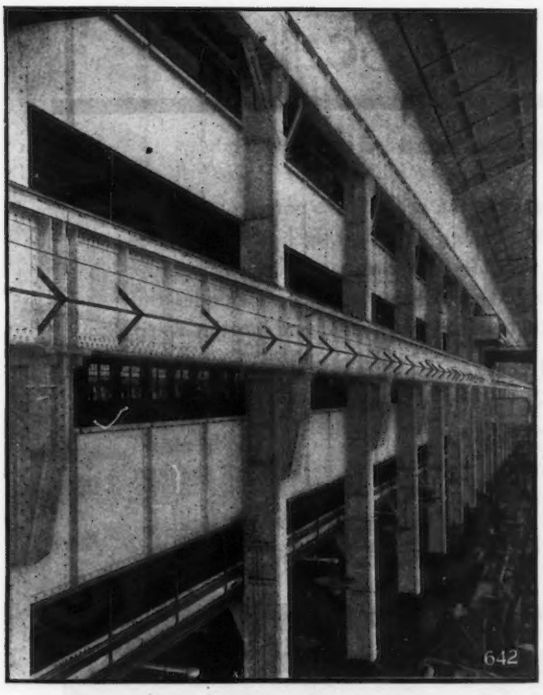
STEAM ELECTRICAL AND HYDRAULIC ENGINEERING — MINE AND SMELTER SUPPLIES.

— ANNOUNCEMENT —

¶We will shortly issue the first number of our Magazine to be known as "Machinery News." We have grown so rapidly in the past few years, that it is impossible for us to keep our many friends advised of our products through the trade journals and the ordinary circular or folder. To tell the truth we have been so selfish and absorbed in our business that we have not really had the time to give our products, absolutely the best in their various lines, the publicity they should have had, but henceforth we will keep you informed; customers, acquaintances, everybody interested in the various lines we manufacture or supply. We have on hand in our large main building and various warehouses the largest stock of mining machinery and supplies west of Chicago—in fact there is no other house in the country just like "HENDRIE & BOLTHOFF." Of course you have heard of us—but to KNOW us, DEAL with us, that is the secret of our success—the way we treat our customers. But, if you want to be sure of a copy of the first number of our Magazine, just drop us a postal—you will not regret it. Address ?

The Hendrie and Bolthoff Mfg. & Supply Co.,

1621-1639 17th Street, DENVER, COLORADO, U. S. A.



Contracting Offices in
23 American Cities
General Offices: 42 Broadway, New York.

American Bridge Company of New York

Structural Steel for every Purpose

Annual Capacity
700,000 Tons

CRUSHING ROLLS

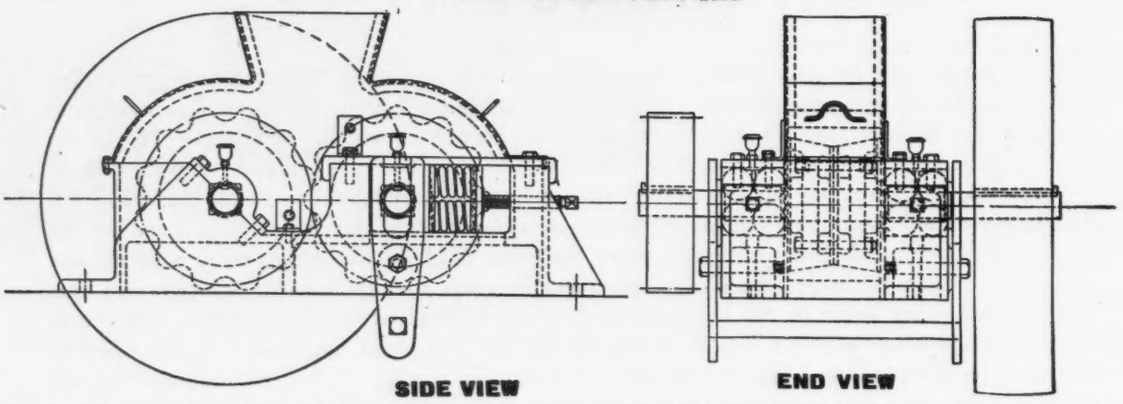
BUILT IN ANY STYLE AND SIZE. OUR ROLLS HAVE THE ADVANTAGE OF BEING KEPT ALWAYS ABSOLUTELY PARALLEL BY A NOVEL DEVICE FOR WHICH WE APPLIED FOR LETTERS PATENT.

We Construct DRYERS ments; also PULVERIZERS

J.R. ALSING CO'S

24"x12" CORRUGATED CRUSHING ROLLS.

To Meet All Require- and DISINTEGRATORS.



SIDE VIEW **END VIEW**

Original Importers of Silax Lining and the best selected FRENCH FLINT PEBBLES for TUBE MILLS.

J. R. ALSING COMPANY,

R. F. ABBÉ, President. **FOUNDED 1869.**

MAIN OFFICE: 136 LIBERTY ST., NEW YORK.

The Effect of Scale

Boiler Tube Clean.

Boiler Tube with 3-16 Inch Layer of Scale.

The two lines above show the comparative difference in the evaporative power of the same boiler tube when in a clean condition and when incrustated with 3-16 inch of scale. You will notice how a comparatively thin layer of scale considerably decreases the efficiency of your boiler, thus increasing the coal consumption for the same steam generation. Besides this increased expense, the tubes themselves are liable to become overheated and burst or warp.

The Dearborn Chemical Treatment Positively Neutralizes All Scale-Forming Substances

and keeps the tubes clean and at their highest efficiency all the time. It also removes any scale that may have formed before the treatment was used, and it saves all the cost and delay of shutting down every week or two to clean the boilers.

Send us a gallon of the water you are now using, for complete analysis, and we will tell you the cost of a special treatment which we will absolutely guarantee to prevent the scale from forming. *Write for Booklet "D."*

Dearborn Drug and Chemical Works

Wm. H. Edgar, Founder.

Manufacturing and Analytical Chemists, Chemical Engineers,

NEW YORK	CHICAGO	DENVER	SAN FRANCISCO
299 Broadway	226-234 Postal Telegraph Bldg.	Boston Block	115 Davis St.

Branch Offices in 20 Other Cities of U. S.

STAMP BATTERIES FOR ORE CRUSHING

With Stamps of every weight

Shoes and Dies of forged Krupp Steel

Patent Key Fastening of Cams

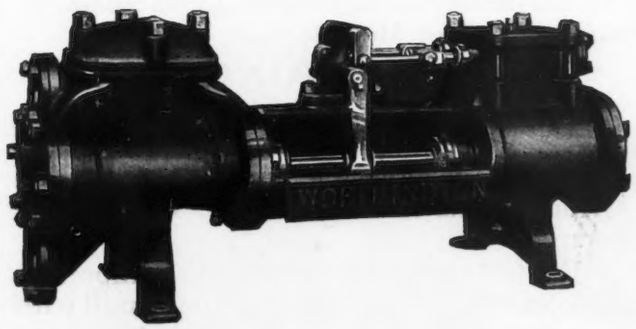
High Speed Gravitation Stamp Mills, Morison's Patent

FRIED. KRUPP, A.-G. GRUSONWERK, Magdeburg-Buckau (Germany)

WORTHINGTON

BOILER-FEED PUMP.

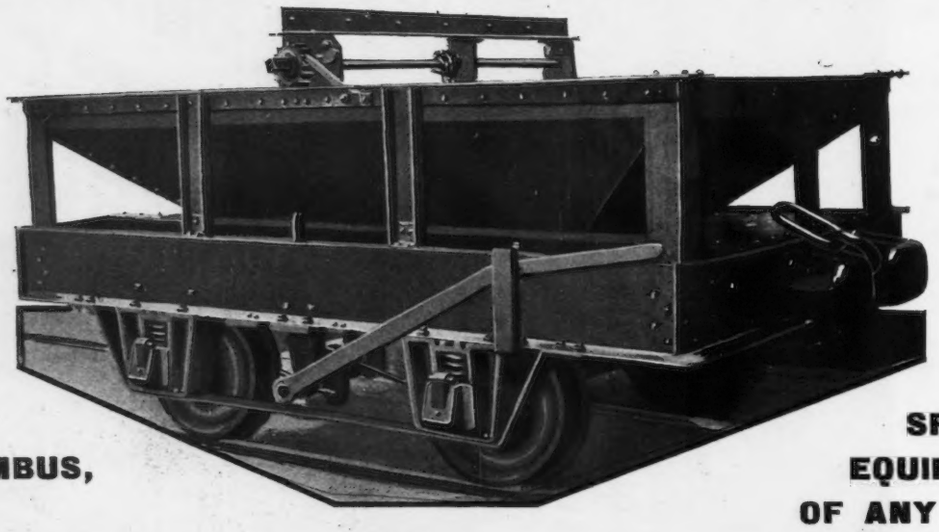
Take time to consider that this pump handles successfully the higher pressures demanded by modern practice. The water end is constructed for working pressures up to 150 pounds and is tested to 400 pounds. Write for Bulletin W 117 J. It will give you a few ideas about pumps.



HENRY R. WORTHINGTON,

114 LIBERTY STREET, NEW YORK.

KILBOURNE & JACOBS MFG. CO.



COLUMBUS, OHIO.

SPECIAL EQUIPMENT OF ANY KIND.

THE ONLY GENUINE WHITNEY CAR WHEELS. QUALITY TESTED SINCE 1847.

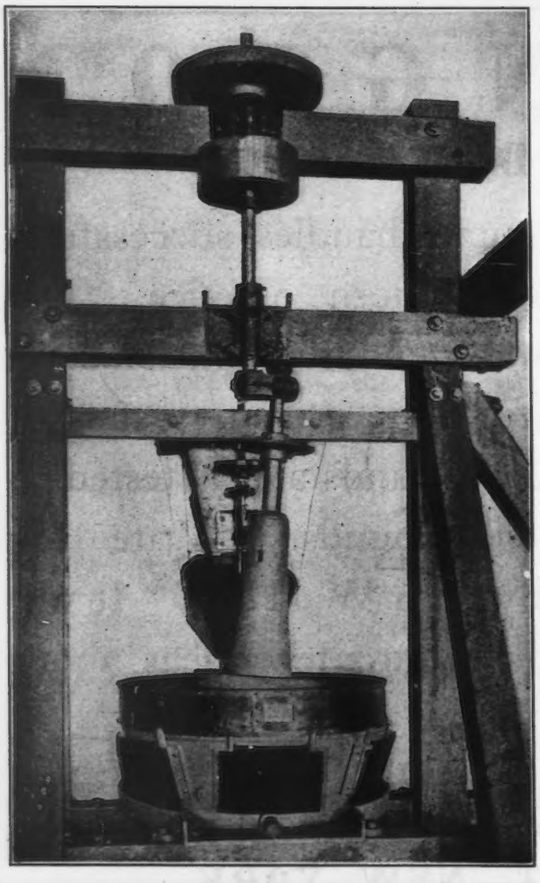
OILED 6 to 12 TIMES A YEAR
WEAR 15 to 25 YEARS
EASIEST RUNNING

SANFORD & DAY

MAIN OFFICE & FACTORY, KNOXVILLE, TENN.
NORTHERN OFFICE, BETZ BLDG., PHILADELPHIA, PA.

COAL CARS
ORE CARS
MARBLE CARS
CONTRACTORS CARS

SUCCESSORS TO A. WHITNEY & SONS, CAR WHEEL WORKS, PHILADELPHIA, PA.



The Improved Kinkead Mill

HEAVY TYPE 1906 MODEL

Weight, complete, about 8,000 lbs.
Weight, on Ore, about 5,000 lbs.
Power required, between 3 and 4 H. P.
Capacity from ten tons up, per 24 hours, depending on character of ore, size of screen, etc.
Feed, Automatic.
Speed, from 190 to 225 R. P. M.
Wear, less than any mill in the market, per ton crushed.
Foundation, Ordinary Mud Sills.

FOR REGRINDING

We have perfected the Kinkead Mill as a regrinder without the use of screens, by means of an overflow discharge, the Mill acting as a regrinder, agitator and hydraulic sizer at one operation.

For full particulars of this most important development and for catalogues of the mill with blue-print of installations, etc., write to

Henshaw, Bulkley & Company

GENERAL MACHINERY MERCHANTS

Corner Fremont and Mission Streets, San Francisco, Cal.

WATT

MINE CARS ORE CARS

QUARRY CARS

The Watt Mining Car Wheel Company

BARNESVILLE OHIO U. S. A.

WOOD AND STEEL CARS

THE POWER FOR YOU

To Operate your Mine at Double the Present Profit Can Be Had for a Small Amount of Money.

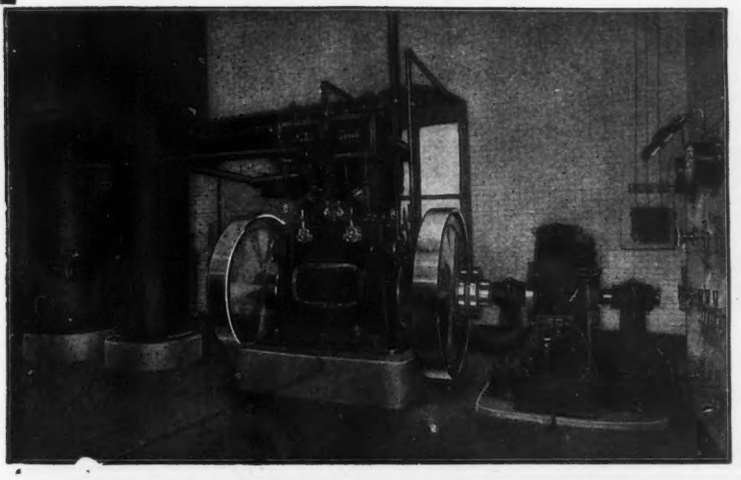
HIGHEST AWARD

ESTABLISHED 1884. PRODUCER

WEBER

GAS GASOLINE ENGINES AND HOISTS

GOLD MEDAL



Built in sizes to 350 H. P.

WEBER GAS POWER PLANTS

operate for $\frac{3}{10}$ of One Cent per H.P. Hour and consume 1 lb. of Anthracite Coal per H.P. Hour. Coke, Charcoal or LIGNITE COAL can be used.

THE HIDALGO MINING COMPANY.

PARRAL CHIH, MEXICO, July 14th, 1904.

The Weber Gas & Gasoline Engine Company,
Kansas City, Mo.

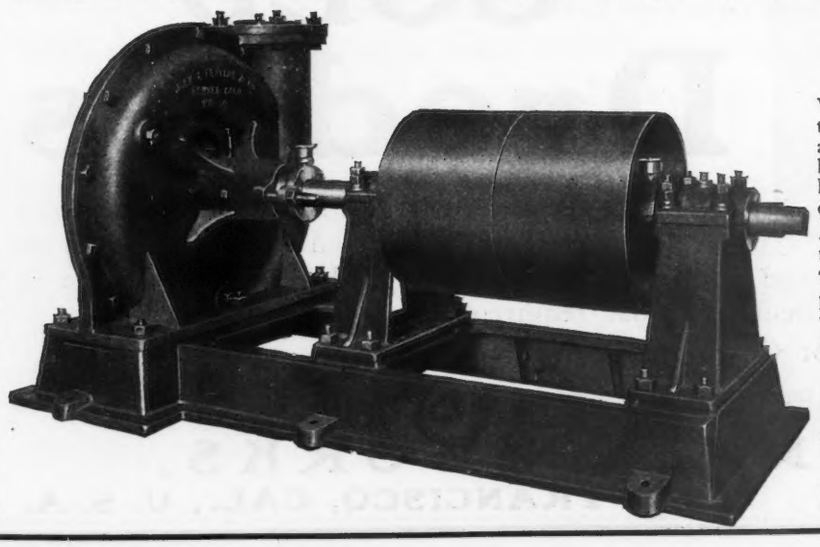
GENTLEMEN:—We take pleasure in stating that the Weber Suction Gas Producer that we bought of you to connect with our hoisting engine is giving entire satisfaction, and is within your guarantee in regard to consumption of charcoal. We find we can use either oak or pine charcoal with equal efficiency, and while we were running at a cost of $17.00 per day for gasoline we are now running at a cost of $5.00 per day for charcoal.

Yours truly,
THE HIDALGO MINING CO.
By R. J. Long, Gen'l Supt.

Weber Gas and Gasoline Engine Co.

P. O. Box 277, Kansas City, Mo.

Don't You Know the Traylor Solid Lined Centrifugal Pump?



STRONG, DURABLE, EFFICIENT

We give the highest efficiency of any centrifugal pump manufactured. Pumps run as smooth under 80 ft. head as under 10 ft. head. We guarantee these pumps to handle sands up to 2 mm. at least 5% cheaper than can be done on a belt elevator. All wearing parts easily and cheaply renewed.

Thrust Bearing. Our pumps are equipped with thrust bearing which does away with all undue friction from "end thrust."

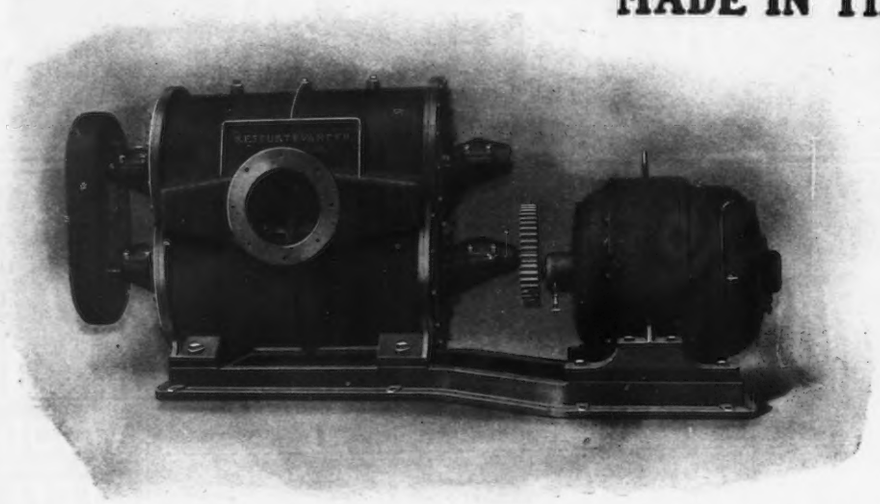
SEND FOR CIRCULAR.

John A. Traylor & Co.

Mining and Milling Machinery,

1634 Blake St., Denver, Col.

MADE IN THE SAME SHOP



with the same refinement in design and workmanship. Such is the Sturtevant High Pressure Blower and the Sturtevant Motor that drives it.
The name
"STURTEVANT"
is our guarantee.
Bulletin No. M127J may be had for the asking.

B. F. STURTEVANT COMPANY,
BOSTON, MASS.
General Office and Works:
Hyde Park, Mass.

New York, Philadelphia, Chicago, London.

Designers and Builders of Heating, Ventilating, Drying and Mechanical Draft Apparatus; Fans, Blowers and Exhausters; Steam Engines, Electric Motors and Generating Sets; Fuel Economizers; Forges, Exhaust Heads, Steam Traps, etc. 565

GOLD DREDGES

BUILT BY
AMERICAN LOCOMOTIVE COMPANY.
From designs by A. W. ROBINSON, M. Am. Soc. C. E.

Dredges of all kinds and sizes for every class of service.

STEAM SHOVELS,
LOCOMOTIVES.

ATLANTIC EQUIPMENT COMPANY,
RAILWAY EXCHANGE, CHICAGO. 111 BROADWAY, NEW YORK.

An El Dorado Dredge

GOLD Dredges

We are the largest manufacturers of Gold Dredges in the world and are in a position to quote prices on the building and erection of Gold Dredging Machinery anywhere in the world. Send us full particulars of your requirements.

Send for Gold Dredge Catalogue No. 17.

Our works were uninjured and are in full operation.

RISDON IRON WORKS,
272 STEUART ST., SAN FRANCISCO, CAL., U. S. A.

THE SNOW MILL

The Mill of today and the future

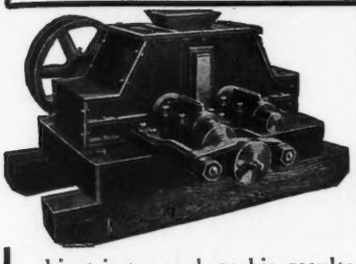
Capacity, - - 25 Tons **Weight 4,000 lbs.**
Horse Power, - - 13 **Price, - - - $600**

For details and information address

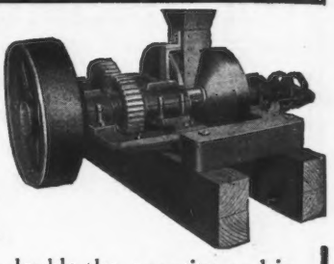
Tennessee Iron Works,

2132-2144 Atlantic St.,
LOS ANGELES, Cal., U. S. A.

Can place 1,000 ton plant in 30 days and guarantee successful operation.



Do you suppose for one moment that you're saving all the values you might with that stamp mill of yours? If you'll take the trouble to write a postal for our catalog, you'll soon find out that you **aren't** and that you **could,** with a



National Ore Pulverizer.

It's a simple machine built on scientific principles. Its object is to produce big results at small cost. It brings the ore to the concentrator in double the quantity and in 60 to 75 per cent. better condition than your stamp mill does, and with a saving of 50 to 75 per cent. in slimes and 75 per cent. in power. It costs 40 to 60 per cent **less** to install than a 20 stamp mill. It PULVERIZES, FRICTIONIZES, GRANULATES. We can prove our figures. How about the catalog? Shall we send it?

The W. L. McCullough Company, 1230 MAJESTIC BUILDING, DETROIT, MICH.
FACTORY, YPSILANTI, MICH., U. S. A.

Manganese Steel

For CRUSHERS

Mine Car Wheels,
Roll Shells, Screens,
Dredge Lips,
Steam Shovel Teeth,
Sprocket Wheels and Chain, Etc.

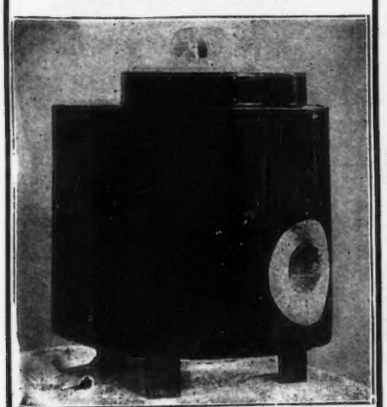
Send for Catalogue

Taylor Iron & Steel Co.

Main Office and Works,
HIGH BRIDGE, N. J.

SOLE MANUFACTURERS IN AMERICA UNDER THE HADFIELD SYSTEM AND PATENTS

MELTING FURNACES FOR GASOLINE.



TAKING BLACK LEAD CRUCIBLES NOS. 7-80.

Zinc Shavings

Fresh Cut

Cyanide

Black Lead Crucibles

Assayers' and Chemists' Supplies

The

Denver Fire Clay Co.

1742 Champa Street, Denver, U. S. A.
It will pay to get our prices.

BULLION MOULDS.

FOR CRUCIBLES UP TO NO. 150.

HOSKINS HYDRO-CARBON (Gasoline)
Blow Pipes and Assay Furnaces.
For 23 years the standard outfit. Nothing better at any price. Send for catalog and FREE sample of our "Brownite" Cupel
THE HOSKINS COMPANY,
93 Erie St., Chicago.
Successor to Wm. Hoskins & Co., 81 S. Clark St., Chicago.

CARTERVILLE
FOUNDRY & MACHINE WORKS
Manufacturers of
MINING MACHINERY
Carterville, Mo.
SEND FOR CATALOGUE.

Our Specialties

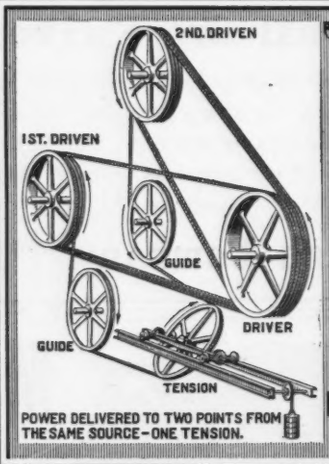
Conical or Cylindrical Revolving Screens; Slow-Moving Conveyors or Picking Belts; Revolving Picking Tables; Slow-Moving Elevators, perfect discharge of buckets; Friction Hoists; Jigs for ore. And all kinds of Machinery for washing aud preparing Iron and Manganese Ores and Phosphate Rock. Send for quotations. Yes! we can send "Rush" delivery.

McLanahan-Stone Machine Co.,
Hollidaysburg, Pa., - U. S. A.

KENT QUARTZ GRINDER

Makes best pulp for Cyaniding.
100 Tons per day
Uses less than 25 H. P.
Minimum Repairs.

KENT MILL CO.,
170 Broadway, New York.



POWER DELIVERED TO TWO POINTS FROM THE SAME SOURCE - ONE TENSION.

"ROPE DRIVING"
IS THE STEADIEST AND QUIETEST OF ALL SYSTEMS FOR TRANSMITTING POWER.
OUR INSTALLATIONS CONVINCE
GEO. V. CRESSON CO.
POWER TRANSMITTING MACHINERY
PHILADELPHIA AND NEW YORK

PLANTS ERECTED
FOR THE
TREATMENT OF SOUTHERN GOLD-BEARING SULPHURETS

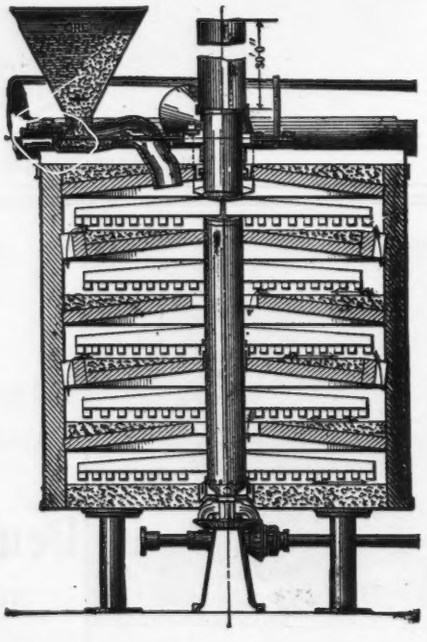
Particulars on Application
Manufacturers of Mining Machinery. . . . . .

Mecklenburg Iron Works
CHARLOTTE, N. CAROLINA

Nichols Copper Co.
25 BROAD STREET
NEW YORK

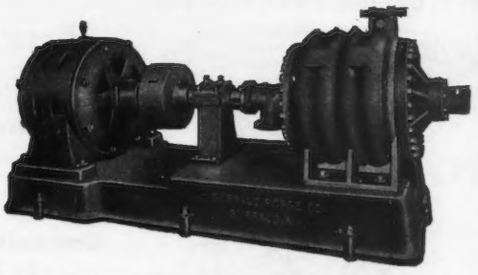
THE HERRESHOFF ROASTING FURNACE
FOR DESULPHURIZING ORES

For Particulars see Page 237, Mineral Industry, Vol. VI, or apply to Manufacturers



BUFFALO PUMPS

STEAM POWER CENTRIFUGAL AND TURBINE PUMPS FOR EVERY SERVICE



Built from new patterns embracing modern features Designed throughout to meet unusual conditions.

Illustrated Catalogue No. 87 ready—It prints the prices—Ask.

BUFFALO FORGE COMPANY,
BUFFALO, N. Y.

FANS FOR MINE VENTILATION

HOISTING and HAULING ENGINES

The fan that uniformly gives satisfaction is a safe investment. As one customer says, "An every day fan, good every day in the year and long life, no breakdowns." A satisfied customer tells his neighbor—one job sells another.

Orders come spontaneously and as liberally as ever.

Get the catalog.

Crawford & McCrimmon Co.
(Established 1869.)
Brazil, Indiana, U. S. A.

A TIME SAVING SYSTEM FOR THE MINE.

We want to tell you about a system that keeps the Superintendent in constant touch with every part of the mine, and how it saves time in giving orders and directing the work. We'll show you how the saving effected by our system will quickly pay for a complete

Mine-a-Phone

equipment. The Mine-a-Phone is a specially constructed telephone suitable for mines and all underground uses; will stand hard usages and the damp conditions under which it must work and always give satisfactory service—is not affected by dampness, gases or other destructive agents. Mounted in iron case—thoroughly and effectively protected from all harm. Simple to install—simple to operate. A time-saver every day. We'll give you the reasons if you'll write. Ask for Bulletin "J" and all the other facts.

Stromberg-Carlson Tel. Mfg. Co.
Rochester, N. Y.
Chicago, Ill.

THE DANVILLE HOIST

Is Proved By The Records It Has Made

The Danville has repeatedly established its betterness. It holds many hoisting records.

One 18" x 36", 6-ft. drum, Danville hoisted 2,388 tons of coal in 8 hours, or *4.87 tons per minute.*
An 18 x 32, 6-ft. drum, Danville hoisted 202 tons per hour for *277 successive days.*
A 16 x 32 Danville, in 210-ft. shaft, in 272 days produced 406,248 tons.

There is no scrimping of weight in this engine.
We make no "hastily-assembled" Danvilles.
We make an engine that is the legitimate crown to *30 years* of experience in this line.
If you have hoisting to do, the Danville can do it better, and in the long run cheaper.
Please favor us with your wants.

DANVILLE FOUNDRY & MACHINE CO.

DANVILLE, ILL., U. S. A.

AUSTIN MANUFACTURING CO.

Builders COMPLETE Rock and Ore

CRUSHING PLANTS

Revolving Screens, Elevators, Dump Cars, etc.

Compared with others, the

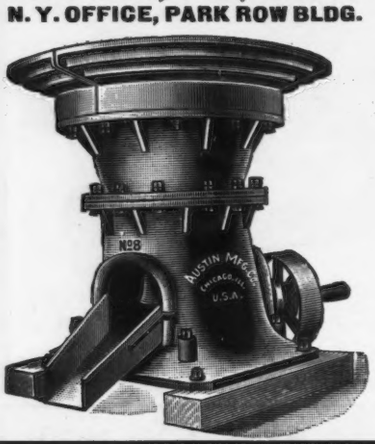
Austin is More Durable

Has greater capacity per horse power, easier adjustments, stronger parts, is of more scientific design, and is the only automatically lubricated crusher on the market.

Two Grand Prizes, Three Gold Medals at World's Fair, St. Louis, 1904.

Highest Awards over all competitors.

CHICAGO, ILL., U.S.A.
N. Y. OFFICE, PARK ROW BLDG.



Discriminating Mine Engineers invariably admit that the

Austin Gyratory Crushers

Embody Improvements

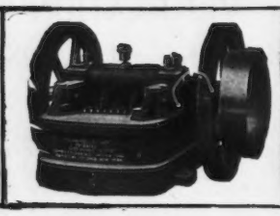
which overcome the faults of other crushers that have aggravated mine owners and operators for years

Capacities ranging from 40 to 2,000 tons daily.

BUILT IN NINE SIZES.

Hundreds of Austin Crushers in use in all parts of the world.

FARREL ORE AND ROCK CRUSHER

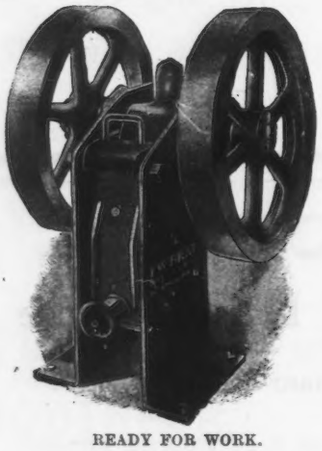


Specially designed and constructed for HARDEST kind of work and Large Receiving Capacity
In use by largest MINING COMPANIES

FARREL FOUNDRY & MACHINE CO.,
EARLE C. BACON, Engineer
Havemeyer Building, NEW YORK.

Braun's Chipmunk Crusher.

Patented Feb. 2, 1905.



READY FOR WORK.

STEEL FRAME INSURES STRENGTH AND DURABILITY.

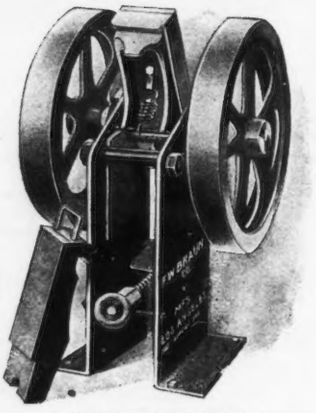
EASILY CLEANED.

MADE IN TWO SIZES.

300 AND 500 POUNDS PER HOUR.

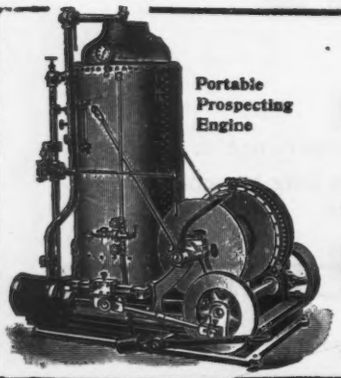
F. W. BRAUN CO.,

San Francisco and Los Angeles,
CALIFORNIA, U. S. A.



OPEN FOR CLEANING.

OUR CATALOG OF "MODERN ASSAYERS' APPLIANCES" SENT ON REQUEST.



Portable Prospecting Engine

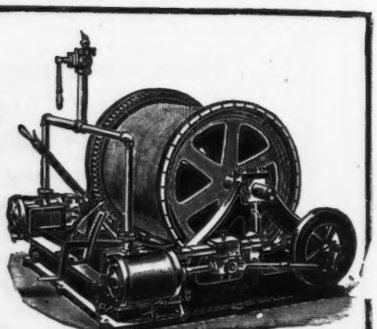
LIDGERWOOD
Hoisting Engines and Cableways

are standard for Mining, Quarrying, Logging, Dam Construction, etc.

Steam and Electric Hoists. Over 24,000 in use.

Send for Catalogues.

LIDGERWOOD MFG. CO.,
96 Liberty St., New York.
Seattle, Chicago, Cleveland, Philadelphia, Atlanta, Boston, New Orleans, Pittsburgh, Denver, Colorado.

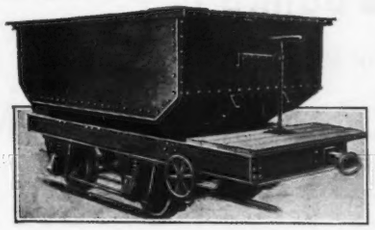


Lidgerwood Standard Mining Hoist.

STEEL MINE AND ORE CARS

OF EVERY DESCRIPTION

Industrial
Railways
Turntables
Etc.



Send for Catalog.

Engineering Works of WONHAM-MAGOR

Department F, Columbia Building, N. Y.

NEW YORK—Columbia Building, 29 Broadway.
BOSTON—Oliver Building, 141 Milk Street. WORKS—Passaic, N.J.

The Arizona & Sonora Mfg. Co.

Nogales, Arizona.

Makes a Specialty of

SECTIONAL MINING MACHINERY

for

MULE BACK TRANSPORTATION

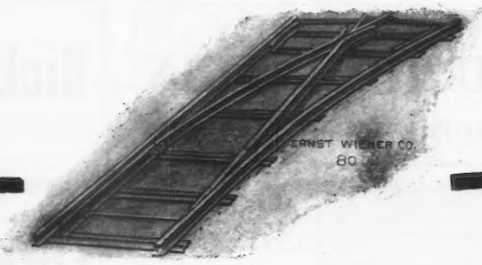
REVERBERATORY SMELTING FURNACES

USING WOOD FOR FUEL

Contracts taken for Complete Plants erected

ROY & TITCOMB, Inc., Sales Agents

Nogales, Arizona. Douglas, Arizona. Hermosillo, Sonora, Mexico Guaymas, Sonora, Mexico. Mazatlan, Sinaloa, Mexico.



COMPLETE TRACK LAYOUTS

We furnish everything for the complete equipment of industrial railway installations. We design, build, install and equip industrial railways for all kinds and conditions of service.

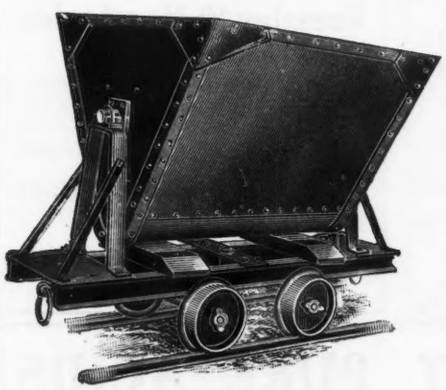
WE CARRY IN STOCK

Cars, Rails, Track, Turntables, Frogs, Switches, Crossings, &c., ready for prompt shipment.

SEND FOR CATALOGUE No. 5G.

RAILROAD SPECIALISTS FOR ALL INDUSTRIES.
ERNST WIENER COMPANY

68 Broad St., New York Works: Youngstown, O.



SELF-ACTING DUMP CARS

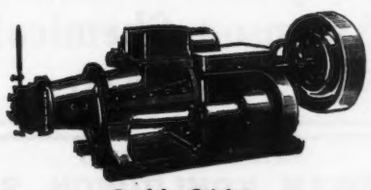
BUILT FOR HARD SERVICE.

Write us for prices.

ARCHER IRON WORKS

CHICAGO, U. S. A.

Brick and Drain Tile Machinery



Send for Catalog

E. M. FREESE & CO.,

Galion, :-: Ohio.

Rife Hydraulic Ram

(Pump water by water power)

Mining, Irrigation, Railroad Tanks, Town Water Works, Country Homes.

No attention—No expense—Runs constantly.

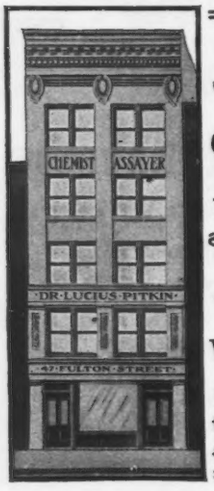
RIFE AUTOMATIC HYDRAULIC RAM

Operate under 18 inch to 50 feet fall. Elevates 30 to 1. 5000 in use. Catalog free.

RIFE RAM CO., 111½ Broadway, New York City

Rierson Machinery Co., Portland, Oregon, Agent.

DR.
LUCIUS PITKIN
Chemist and Assayer



Gold
Silver
and
Copper
Bearing
Products
a Specialty

Sampling
and
Weighing

Entire charge taken of consignments.

The Pitkin Laboratory Building, designed for and (excepting store) entirely occupied by my offices and laboratories

Assayer by Appointment to New York Metal Exchange
UMPIRE ASSAYS
General Chemical Practice

47 Fulton St., New York City

Ricketts & Banks
New York

ORES TESTED

Complete Ore Milling and Testing Works for making practical working tests of ores to determine the best method of treatment. Milling, Metallurgical and Chemical Processes investigated.

ASSAYS AND ANALYSES

Assayers by Appointment to New York Metal Exchange.

Examinations of Mines and Mineral Properties

Mining, Milling and Smelting Operations Directed

Office and Laboratories
104 John Street
NEW YORK

Ledoux & Co.
NEW YORK

SAMPLE
AND
ASSAY ORES
AND
METALS

Independent Ore Sampling Works at the Port of New York. Only two such on the Atlantic Seaboard.

We are not Dealers or Refiners, but Receive Consignments, Weigh, Sample and Assay them, selling to highest bidders, obtaining advances when desired, and the buyers of two continents pay the highest market price, in New York funds, cash against our certificates.

Laboratory and Office:
99 JOHN STREET

LEDOUX & CO.
Also Analyze Everything

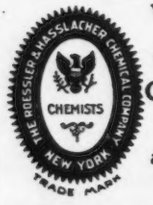
THE NEW CYANIDE
GOLDEN BRAND
120% to 130% Cyanogen.
James Lee & Co.,
76 William St., New York.
Sole Agents in the United States for the Manufacturers.
THE UNITED ALKAKI COMPANY, LIMITED.

BOOTH, GARRETT & BLAIR
(ESTABLISHED 1836.)
ANALYTICAL AND ENGINEERING CHEMISTS.
Most Complete Commercial Laboratories in America

Cargo and carload sampling.
Cement sampling and testing.
Reports on Cement Properties.
Analyses of metals, Assays of ores.
Analysis of Water for Boiler and Sanitary purposes.
Thoroughly equipped bacteriological laboratory.
Examination of Mines.

404-406 Locust St., Philadelphia, Pa.

THE
Roessler & Hasslacher
Chemical Company
100 William Street, NEW YORK
Works: Perth Amboy, N. J.



Cyanide, 98/99%
Cyanide of Sodium.
125/130%
and other Chemicals for Mining Purposes.

C. P.
Test Lead
Litharge
SILVER FREE
If your supply man doesn't handle our goods, write us.
PENNSYLVANIA SMELTING CO.
Office: 331 4th Avenue, Pittsburg.
Works: Carnegie.

ELECTROLYTIC LEAD REFINING.
For licenses in the United States, England, Germany, Mexico and Australia.
ANSON G. BETTS,
Troy, New York, U. S. A.

CHEMICALLY PURE ACIDS
Hydrochloric, Nitric, Sulphuric, etc. Chemical Salts and Reagents. Ashless Filter Papers of superior quality. Shimer Combustion Apparatus.
The Baker & Adamson Chemical Co.
EASTON, PENNA.

ESTABLISHED 1859
HERMAN KOHLBUSCH, SR.,
194 BROADWAY, NEW YORK, N. Y.
MANUFACTURER OF
FINE BALANCES AND WEIGHTS
For every purpose where accuracy is required.
Send for Illustrated Catalogue.

L. VOGELSTEIN BENJAMIN HIRSCH E. G. HOTHORN
Special Partner

L. Vogelstein & Co.
90-96 Wall Street, New York

AGENTS FOR
ARON HIRSCH & SOHN
HALBERSTADT, GERMANY

Copper, Argentiferous and Auriferous Copper, Mattes a d Bullion, Lead, Tin, Antimony, Spelter.

See adv., De Lamar Copper Refining Company on page 83.

RARE MINERALS
purchased and sold direct or on consignment. Constantly in the market for Tungsten Ores, Molybdenite, Columbite, Uranium, Garnet, etc.
EDGAR C. RIEBE & CO.
97 Warren St. - New York City

MATHISON & CO.
71 Pine Street, New York.
Buyers of
Antimony Ores

BUYERS
of Vanadium, Uranium, Tungsten, Cobalt, Nickel and other rare ores.

Stanley Jordan & Co.
100 William St., New York.

MOUNTAIN COPPER CO., LIMITED
Point Lewis Sampling and Reduction Works, near Martinez, Cal.

Buyers of gold, silver and copper ores; copper mattes, concentrates and furnace products.

Office: 1020 Fourteenth St.
OAKLAND, CAL.

The American Metal Co., Ltd.
52 Broadway, New York.
Security Bldg., St. Louis, Mo.
EUROPEAN CORRESPONDENTS
HENRY R. MERTON & CO., Ltd. London
METALLGESELLSCHAFT Frankfort, Main

UNITED METALS SELLING CO.
42 BROADWAY, NEW YORK
European Agents, C. S. HENRY & CO., Ltd. 12 Leadenhall St.
London, E. C.

Balbach Smelting and Refining Co.
NEWARK, N. J.
Smelters and Refiners of
Gold, Silver, Lead and Copper Material
ELECTROLYTIC COPPER REFINERY

LOUIS STRAUS & COMPANY
Dealers in ores and minerals. Purchase and sell ores of all kinds. Advances made on consignments. Rare minerals a specialty.
Correspondence Solicited.
60 and 62 NEW STREET, NEW YORK CITY

Henry Bath & Son
LONDON LIVERPOOL AND SWANSEA
BROKERS
All Descriptions of
METALS, MATTES, Etc.
Warehouses, Liverpool and Swansea.
Warrants issued under their Special Act of Parliament.
NITRATE OF SODA
Cable Address, Bathota, London.

EMIL BAERWALD,
100 Broadway,
NEW YORK CITY
Representing
LEWIS LAZARUS & SONS
London, England
Importer of
Pig Tin and Tinplates.
Ores, Mattes and Metals

CYANIDE
CHEMICAL SULPHIDES
CHLORIDE OF LIME ZINC DUST
HYPOSULPHITE OF SODA
A. Klipstein & Co.
122 Pearl Street, New York
Chicago, Boston, Philadelphia, Providence
Montreal and Toronto, Canada.

The Nichols Copper Co., 25 Broad St., NEW YORK
COPPER REFINERS
Consignments of Ores, Mattes and Blister Copper solicited
COPPER SULPHATE
MANUFACTURERS OF
The Herreshoff Copper Smelters
The Herreshoff Roasting Furnace
See advertisement on page 30

MACHINERY AND RAILS FOR SALE.

RAILS FOR SALE

QUICK SHIPMENTS FROM STOCK
30-, 35-, 40-, 52-, 56-, and 60-lbs.

RELAYING RAILS
12-, 16-, 20-, 25-, 30-, 35-, 40-, 55-, 80-, 90-, and 100-lbs.

NEW STEEL RAILS

All these rails are ready for shipment as soon as cars can be placed, and we can quote low prices.
Please write, or wire us for quotations.
We also buy new and relaying rails of all sizes.

IRON CITY STEEL CO., Bessemer Bldg., Pittsburgh, Pa

BARGAINS FOR SALE.

The following items are offered for quick sale If you are interested, you had better correspond with us at once. We are constantly changing this list.

Our stock includes a considerable quantity of material from the St. Louis World's Fair, as well as from our purchases from various sources.

1 28x48 Corliss Engine.
1 800-H. P. Allis Corliss Engine.
1 16x42 Cooper Corliss Engine.
1 "Hall" Air Compressor, size 16x16x14, built by the Hall Steam Pump Company, Pittsburg, Pa.
1 Complete high-grade power equipment, consisting of:
1 9x12 Heavy Duty Automatic "Ball" Engine;
1 11x12 Self-Oiling Center Crank "Green" Engine, together with one 150 K. W. "Heine" water tube boiler, two 40 K. W. multipolar self-oiling latest type 250-volt direct-current Generators.
2 18x30x16 "Westinghouse" Compound Engines.
2 14x24x14 "Westinghouse" Compound Engines.
1 6x10 ft. and one 6x5 ft. Webster, Camp & Lane Drums, with shafts.
1 18x42 "Allis-Chalmers" Heavy Duty Corliss Engine.

A special snap on a 60 H. P. Erie City Economizer, nearly new.

All kinds of Horizontal Tubular Boilers, from 10 to 150 H. P.
50 Fire Box Boilers.
1 16x18 double cylinder, double drum "Lidgerwood" hoist, with 6-ft. drums.
1 16x30 "Bass" piston valve engine.
Engines of every size—gas, gasolene and steam.
1 Bullock "Champion" Diamond Prospecting Core Drill, complete, with 1500 feet of Rods, Boiler, Pump and all equipment. Will rent or sell.
We also have 12 very fine Carbons for sale.
3 Electrical Mine Equipments, consisting of 2 16x16 center-crank Ball Engines, 2 100 K. W. Morgan & Gardner Generators, with switchboard, Driving Belt, etc.
10 Crawford & McCrimmons 10' and 12' fans, with Engine connected.
1 24x36x6x8 Worthington Compound Duplex Mine Pump.
2 72x18 Triple-Riveted Boilers, with all connections and equipment, 150 lbs. working pressure.
1 5' Huntington Mill, all complete.

ELECTRICAL APPARATUS.

100 miles of Stranded Copper, triple braid and Rubber Covered Feed Wires, sizes 1/0 to 600,000 C. M.
50 Motors, 500 volt, from 1 to 15 H. P.
An enormous stock of other items in the Electrical Line.

HYDRAULIC PIPE.

2 miles of heavy flanged Hydraulic and high-pressure wrought iron lap-welded pipe, ranging in sizes from 10 to 16". This pipe is flanged with tongued and grooved flanges, and will stand a higher pressure than any pipe manufactured. We can furnish with this pipe Crosses, Ells, Tees and a full line of Valves to match.

STANDARD WROUGHT-IRON PIPE.

50 miles of all sizes of Standard Wrought-Iron, lap-welded pipe, in sizes from ¾ to 16".

OTHER PIPE.

Cast Iron Pipe, in sizes from 6 to 36".
Tile Pipe, from 6 to 42".
Riveted Pipe, from 6 to 96".
Spiral Riveted Pipe, from 4 to 36".
Extra Heavy Wrought-Iron Pipe, sizes from 3 to 26".
Square wooden Pipe, 4½x4½".
Converse Pipe, 2 to 8".
Pipe of every kind.

ASK FOR OUR SPECIAL EXPOSITION CATALOGUE No. 316.

CHICAGO HOUSE WRECKING COMPANY,
35th and Iron Streets, CHICAGO.

CONTRACTORS' EQUIPMENT.

We offer for sale the following material for prompt delivery:

7 Air Compressors, 24 in. x 24¼ in. x 30 in.
4 Vertical Air Receivers, 60 in. x 14 ft. 0 in.
1 2000 H. P. Improved American Heater.
17 100 H. P. Economic Return Tubular Boilers, complete with fittings.
1 Garvin Machine Co. Lathe, 16 in. swing.
1 Wiley & Russell Bolt and Pipe Threading Machine. Will thread from ⅛ in. to 2 in
1 Planer, size of bed, 16 in. x 36 in.
1 Garvin Machine Co.'s Drill Press.
1 Niles Tool Works hydrostatic Wheel Press.
1 No. 6 Pipe Cutting and Threading Machine.
2 65 H. P. No. 11 Type No. 5—500 Volt Belted Generators, with switchboard.
2 10 in. x 9 in. Westinghouse Jr. Engines, 62 H. P.
6 Star No. 1 Traction Well Drilling Machines.
11 Star No. 0 Non-traction Well Drilling Machines.
100 Ingersoll-Sergeant Air Drills.
38 Ingersoll-Sergeant Steam Drills.
25 Skeleton Hoisting Engines, Mundy, Lambert & Lidgerwood, 7 in. x 10 in., double cylinder and double drum.
15 Mounted Hoisting Engines, Mundy, Lambert & Lidgerwood, 7 in. x 10 in., double cylinder and double drum.
50 Vertical Boilers, 20, 30, 35, 40 H.P., complete with fittings.
100 Wilson Childs Dump Carts.
24 One-way Dump Cars, 4 yards capacity, standard Allison pattern for 3 ft. gauge of track.
24 Guy Derricks, 45 to 80 ft., also Stiff Leg Derricks, 40 to 60 ft. boom.
1 Atlas Engine, 10 x 14. 40 H. P.
1 18 in. Caampion Blower.
1 836-lb. Steam Hammer, Bement & Miles make.
5 Iron Anvils.
1 Tranter & Davison Gasolene Engine, 8 H. P.
1 Sturtevant Engine, 3½ x 4.
1 Canedy-Otto Drill Press, No. 14.
1 75 H. P. Dick & Church Automatic Centre Crank Engine.
1 Seyfert Engine, 7 x 7, 12 H. P.
1 Emery Machine.
1 30 in. Tinner's Roll.
1 Punch and Shear Combination, hand power.
2 Wiring Machines, hand power.
2 Keystone No. 3 Portable Well Drilling Machines.
3 "Little Jap" Ingersoll-Sergeant Drills.
1 60 H. P Erie City Economic Boiler.
3 six-yard capacity Standard Gauge, 2-way Dump Cars.
12 Centrifugal Pumps, 8 in. suction, 6 in. discharge.
1 " " 6 " " 4 " "
2 Snow Duplex Pumps, 10 x 7 x 10.
1 " " " 7 x 6¾ x 8.
1 Worthington Duplex Pump, 5¼ x 3½ x 5.
1 " " " 6 x 4 x 6.
1 " " " 7½ x 5 x 6.
1 Snow Duplex Pump, 5¼ x 3½ x 5.
5 " " " 6 x 4 x 6.
50 one-yard Dump Buckets.
8 ½ " " "
4 ⅝ " " "
1 Lidgerwood Cableway, complete with 800 ft. 2 in. cable, 60 H. P. engine, double drum, without boiler.
6 one-yard Smith Concrete Mixers.
4 J. I. Case Traction Engines, 24 H. P.
3 Alfred Box's 10-ton Hoist Blocks.
8 Pipe Wrenches, No 15.
8 " " No. 14.
8 " " No. 1.

All of the above material is practically new, having been used only about nine months, and we guarantee same to be in perfect condition. For prices and other information apply to

HENRY A. HITNER'S SONS,
Huntingdon St. and Aramingo Ave.,
PHILADELPHIA, PA.
or Cincinnati Equipment Co., Cincinnati, Ohio.

FOR SALE

A Complete Hydraulic Outfit, consisting in part as follows:

1—Locomotive Fire Box Boiler 96"x16' with 4500 sq. ft. of heating surface.
1—Worthington Compound Duplex Pump with 14" and 25" steam cylinders.
1—Laidlaw-Dunn-Gordon Compound Duplex Pump with 12" and 18" steam cylinders.
1500'—16" Wood Waste Pipe, with 3" shell
2500'—16" High Pressure Wood Pipe
300'—15" Wooden Suction Pipe
100'—18" and 20" Cast Iron Pipe
1400'— 3" Standard Black Pipe
500'— 4" I. D. Casing

Together with the above there is a large list of fittings tools, etc., sufficient to make a complete outfit for hydraulic work. The above is all in good condition and will be sold cheap.—Address:

PORTLAND CORDAGE CO., SEATTLE, WASH

MINING MACHINERY.

At Reduced Prices.

1—40 Stamp Mill, 850 lb. each Stamp.
1—30 Stamp Mill, 850 lb. each Stamp.
2—20 Stamp Mills, 850 lb. each Stamp.
3—10 Stamp Mills, 850 lb. each Stamp.
2— 5 Stamp Mills, 850 lb. each Stamp.
12¼x15 Lidgerwood Double Drum Hoist.
12x20 Scoville Single Drum Hoist.
6x8 Double Friction Hoist.
12-h.p. Fairbanks Gasoline Hoist.
150-h.p. Heine Water Tube Boiler.
2—110-h.p. Horizontal Tubular Boilers.
6—100-h.p. Horizontal Tubular Boilers.
8— 80-h.p. Horizontal Tubular Boilers.
2— 70-h.p. Horizontal Tubular Boilers.
5— 65-h.p. Horizontal Tubular Boilers.
2— 60-h.p. Horizontal Tubular Boilers.
16x16¼x18 Ingersoll Straight Line Compressor.
16x18x11x22 Leyner Compound Compressor.
14x14x18 Laidlaw-Dunn-Gordon Compressor.
12¼x14 Ingersoll Duplex Belted Compressor.
2—5-ft. F. & C. Huntington Mills.
2—60-in. Revolving Ore Dryers.
4 Compound Condensing Mine Pumps.
2 No. 9 B Cameron Sinking Pumps.
1—14x6x13 Cameron Sinking Pump.
4—100-h.p. Standard Feed Water Heaters.
1—14x36 Allis Corliss Engine.
3—13x12 Automatic Engines.
1—9x12 Ball Automatic Engine.
1—9½x10 Armington-Sims Automatic Engine.

Write for our Complete Catalogue No. 36.

The S. H. SUPPLY, CO.,
1801 Lawrence St., Denver, Colo.

BID TOO HIGH.

Many contractors' bids are just a trifle higher than their competitors. Perhaps they failed to take advantage of our

100 Per Cent. Saving Proposition.

SECOND-HAND, CUT TO ORDER

STEEL RAILS

Can be used advantageously instead of Structural Steel, and at a saving of 100 PER CENT.
Can you imagine anything more durable for Braces, Posts, Buck Staves, Pavement Underpinning, etc.?
Let us send you full particulars.

Track Rails, New and Second-Hand, 8 to 100 lbs. Sections.

RICHARDSON & COMPANY, Inc.
1215 Westinghouse Bldg., Pittsburgh, Pa.

Second Hand Machinery

Here You Have Bargains

1 Generator 500 ampere, 1000 revolution, 12 volt machine. General Electric.
1 Type D, 12 volt Generator, 700 revolution.
1 G. E. Type M. P. low voltage Generator, 1000 revolution, 500 ampere, 12 volts.
1 Type D., 9 h. p., 700 revolution, 12 volt Generator.
2 0-15 Voltmeters. And other Electrical Supplies.

Prices quoted very low the next sixty days.

Bradley Engineering Works
Spokane, Washington.

CLARK BROS.,

Financial and Mining Brokers,
401-402 ROOKERY BLDG.,
Spokane, - - Washington.

Copper Mines For Sale from $100,000 and up; also Cyanide and Free Gold Properties. Correspondence Solicited.

NIXON & KIMMEL,
Electrical Engineers & Contractors
SPOKANE, WASH.
DEALERS IN
New and Second-Hand Electrical Machinery
ELECTRICAL REPAIRING
Mining Installations a Specialty

Positions Vacant.

Advertisements under this heading, 50 cents for 50 words or less. Additional words, two cents a word. Cash or stamps must accompany order.

Competent men wanted in all branches of mining and engineering work for good positions now open throughout the Western States and Old Mexico; superintendents, foremen and managers of mines, mills, cyanide plants, samplers and smelters; also assayers, chemists, engineers, surveyors, draftsmen, mill men, electricians, metallurgists, and other technical men. Write for particulars, State age and qualifications. Mining or Engineering Department. Business Men's Clearing House (Established 1903), 355 to 358 Century Building, Denver, Colo. 6,30

The foundation of our business lies in the fact that we are successful in placing men speedily and satisfactorily. We can do this because our corps of trained employment experts know just which men to select for each particular position. Investigate the advantages and facilities we offer. Apply to our nearest office for information *today*. Hapgood's, Suite 511, 309 Broadway, New York City. 6.30

Wanted—Agents in every State to handle exclusive territory on the Cone Gas Generator, which generates coal gas for stationary engines from 25 h.p. up, reducing the cost to 1/5 that of steam power; agents must be conversant with machinery business and devote entire time to the work. Cone Gas Machine Company, 1036 Majestic Bldg., Detroit, Mich. 8,18

Wanted—Competent mining engineer and surveyor to go to Honduras, Central America. One of experience, and speaking Spanish preferred. Address, with references and salary expected, "Minghondu", Care ENGINEERING AND MINING JOURNAL. 6,30

Wanted—Mechanical engineer, draftsman. Apply room No. 1114, 97 Cedar St., New York. 6,30

Wanted, at once—Mechanical engineer, experienced in water concentration of copper ores, to occupy position of superintendent of reduction works; preference will be given to man with smelting and business experience; must be a hustler. Address Box 39, ENGINEERING AND MINING JOURNAL. 7,7

Wanted—For a large iron mine in the State of New York, a mine foreman who has the knack of handling men and who has had an all-around experience as a working miner in hard-ore mines. Give full particulars as to past experience, references and age. "A. E.," ENGINEERING AND MINING JOURNAL. TF.

Wanted—To go with Reynolds Alaska Development Company; honest educated hustler who can run men in hard rock; some knowledge electrical machinery advantageous; salary $200; address, R. N. Cummings, 614 Madison St., Seattle, Wash. 6,30

Wanted—Salesmen and agents in all Eastern and Gulf States and foreign countries on percentage, to sell our gasolene, kerosene and marine agents and producer gas plants. We have an attractive proposition to offer. Model Gas Engine Works, B-21 Produce Exchange, New York. 6,30

Situations Wanted.

Advertisements under this heading, 50 cents for 50 words or less. Additional words, two cents a word. Cash or stamps must accompany order

An analytical chemist and assayer, having recently returned from an engagement in Central America, is open for a position. Thorough analyst of ores, minerals, metals, alloys, cements, coal, paints, oils, and experienced in general organic and inorganic analytical and industrial chemistry; also in cyaniding and refining. Address "Cupel," ENGINEERING AND MINING JOURNAL. No. 21,938, June 30.

Assayer, American, ten years' experience in the United States and Mexico; speaks Spanish and German; no objection to foreign countries. Address "E. A.," ENGINEERING & MINING JOURNAL. No. 21,943, July 7.

A strictly first-class accountant and store manager, experienced in mine accounting, statistical and all general accounts, store managing and buying, boarding house; desires to change his present position. Mexico preferred. Highest references; speaks Spanish. Address "K. T.," ENGINEERING AND MINING JOURNAL. No. 21,947, July 7.

American (38) now treasurer of well known export company, would consider position of export manager, for large manufacturing interest; complete knowledge of export business, shipping and credits and large acquaintance abroad; salary $5000, or part salary and contingent interest. Address "C. B. F.," Care ENGINEERING AND MINING JOURNAL. No 21,948, July 21.

A Columbia School of Mines graduate, with 9 years' experience in the forge and rolling-mill business; also 9 years' experience in quartz and placer mining in Colorado, Montana, Idaho, Alaska, and Colombia. S. A.; wants position as superintendent or assistant; some knowledge of Spanish; will go anywhere. Address "E. B. C.," ENGINEERING AND MINING JOURNAL. No. 21,951, July 7.

Copper metallurgist open to engagement as superintendent, competent in underground work, construction, smelting, milling, assaying, analyzing, drafting, difficult ore treatments, long practical experiences, speaks Spanish. Address "Everett," Care ENGINEERING AND MINING JOURNAL. No. 21,945, July 14.

Chemist and assayer, doing night work, could spend a few hours daily in special analytical work. Am a college man of 24, with three years' practice, mostly in lithographic colors and inks; a good general analyst, able to handle ores and metal as well as gases, oils and resins. This, if only temporary at first, might lead up to a permanent change. References. Address "General," ENGINEERING AND MINING JOURNAL. No.21,936, July 7.

Copper smelter and refiner desires position in copper smelter; has had 30 years' experience and has been foreman of large copper refinery for the past 16 years; can furnish best of references Address "Peru," ENGINEERING AND MINING JOURNAL. No. 21,940, June 30.

Cyanide engineer, open for immediate engagement. Recently mill superintendent in most complete mill and cyanide plant in Nevada; stamps, regrinding mills, tables, tube mill, vanners, slimers, sands and slimes plants. This latter is the system devised by Charles Butters and is making an extraction of over 96 per cent. from slimes worth $20. Have had twelve years' experience with various companies as assayer, amalgamator, cyanide man, master mechanic, foreman and superintendent. Have erected Blaisdell's system of sand excavation. Speak Spanish and accustomed to Mexican ways. Experienced with electro-precipitation for silver ores, and in working out processes for stubborn ores. University of California; 33 years; sober, married; best of references. Address "R. M.," ENGINEERING AND MINING JOURNAL. No. 21,927, July 14.

Do you want a first-class man to operate your mining and milling plant? My experience is thoroughly practical and several years of it. I am now employed and want to change. I can handle any part of the business myself and know when every man is doing his duty. I am also a practical electrician, engineer and machinist. Can design and erect milling and power plants. If you have a reasonable proposition I can make it pay. Address "Reliable," ENGINEERING AND MINING JOURNAL. No. 21,937, July 21.

Engagement wanted with large corporation as assistant manager; experienced in mining, milling, smelting; thorough assayer, analyst and draftsman; economical, energetic and up-to-date; at present in Boston and open to engagement. Specialty: refractory ores. Speaks Spanish. Address "Boston," ENGINEERING AND MINING JOURNAL. No. 21,946, July 14.

First-class mining engineer desires engagement as superintendent of mines or examining engineer; college graduate, highest references, years of experience. Address "F. W.," ENGINEERING AND MINING JOURNAL. No. 21,921, June 30.

It will pay you, and pay you well, to secure your men through the "Clearing House" system. It saves you valuable time, much troublesome work, and affords you a choice of men from among the best throughout the United States. We are supplying the largest and most prominent mining and engineering companies throughout the Western States and Mexico. Send for our new booklet, "Competent Men for Western Employers." Address Mining, or Engineering, Department, Business Men's Clearing House (Established 1903), 355 to 358 Century Building, Denver, Colo. No. 21,935, June 30.

Manager or superintendent, mining engineer; technical graduate with 10 years' experience in the design, construction and operation of coal mines; engaged at present time as assistant general superintendent of large company; refer to present and past employers. Address E. A., ENGINEERING AND MINING JOURNAL. No. 21,934, July 7.

Mining engineer, Columbia graduate, 11 years in subordinate and managing positions in the West, South and Spanish-American countries, open for engagement after July 1: as mining engineer and assistant manager with reliable company or on staff of established consulting engineer. Experience, bituminous coal mining and coke plants, gold placer, copper mining and milling, development work, economic improvements and construction. Spanish linguist and correspondent. Address, "E. M.," P. O. Box 66, Barre, Massachusetts No. 21,950, July 7.

Mining engineer, Freiberg graduate, 18 years' experience in mining and milling in the States, Mexico and South America; with the best of experience and located at present in Mexico; desires change of position as superintendent or manager. Mine in Mexico preferred. English, German or Spanish. Address "S. S. S.," ENGINEERING AND MINING JOURNAL. No. 21,924, June 30

Mining engineer, just completed two years' engagement as manager of mine in Mexico; Spanish spoken; especial experience in silver and gold; opening up of old Spanish mines; success in handling natives and difficult mule transports; examinations and reports made; permanent position desired. Have resided in Philippines and China. "Mexico 30," ENGINEERING AND MINING JOURNAL. No. 21,906, TF.

Mining and metallurgical engineer open for engagement as superintendent or manager; technical graduate; 10 years' experience in milling, cyaniding, concentration and pan amalgamation; specialty, difficult ore problems; at present superintendent of large gold mine in South America; desires a change. Capable of handling plant of any size. A-1 references. Address "Practical," ENGINEERING AND MINING JOURNAL. No. 21,932, July 7

Position wanted as engineer or superintendent with reliable concern by mining graduate desiring change; now with large company; 9 years' practical experience in underground mining, gold, silver, copper, iron; Michigan, B. C., Pennsylvania, Cobalt, New Foundland; experience in copper mills and smelter; references exchanged; state salary, particulars, chances of advancement. Address "Y," ENGINEERING AND MINING JOURNAL. No. 21,931, July 7.

Wanted—Paying location for assay laboratory in West, Mexico, Central or South America, or partnership in established one, by technical graduate with three years' experience, or position with some large concern as analytical chemist. Salary $100 per month. Address "Diaspore," ENGINEERING AND MINING JOURNAL. No. 21,942, June 30.

Wanted—Position as foreman by a practical reverberatory furnace man; copper, or with one of the best known gold, silver and gold and silver on a copper basis; 21 years copper plants in the United States; Swansea process in all departments. Address T. W. C., ENGINEERING AND MINING JOURNAL. No. 21,939, June 30.

Wanted—Position as mining engineer or manager. Thoroughly experienced in mining Lake Superior and Southern ores and concentrating said ores in large quantities by electricity and jigs and washers. I have plans of concentrating mills where I have treated and cleaned daily 1200 tons of ore from rock, dirt and clay. Address 'Bessemer," ENGINEERING AND MINING JOURNAL. No. 21,944, June 30.

Young man, experienced in gold mining and metallurgy, at present assistant superintendent, wants work under engineer, or at mine. Will go foreign. Speaks Spanish. Address "Cyanide," Care ENGINEERING AND MINING JOURNAL. No. 21,949, July 7.

Young mining engineer, with both technical and practical education, at present employed as mining engineer and bookkeeper with a well-known copper-mining company in the West, desires change. Address "X. Y. Z.," ENGINEERING AND MINING JOURNAL. No. 21,941, June 30.

WANTED Information as to available deposits of **Magnetic Iron.** We are owners of special processes for the separation of magnetic iron from **Ores, Sands, Shop Wastes Etc.**; and wish to correspond with engineers or owners of properties suitable for operations by dredging, mining and milling, and separation by special machinery.

PUGET SOUND METALS COMPANY,
Pier 14, Seattle, Wash.

PUMP WANTED.

GOOD SECOND-HAND PRESCOTT; duplex type, vertical Mine Sinking Steam Pump; size about 14 x 8 x 12; describe fully with best cash price.

WILLIS SHAW, 171 La Salle St., Chicago, Ill.

Before Buying or Selling Any
Unlisted Stock or Bond
SECURE MY PRICES.
R. B. Higbee, Germania Life Building St. Paul, Minn.

Land and Mines for Sale

GOLD SILVER COPPER MINE
in Montana.

Tunnel now 700 feet on the lead with 2 feet of continuous ore, average assay value $15.00. Sixteen miles from station, with good road. Price $75,000. Old producing mine near by.
Address: O. BERGSTROM,
Butte, Montana.

MINES FOR SALE.

Gold, Silver and Copper Mines in the Northwestern part of the United States, Alaska and British Columbia, both developed and undeveloped.

N. W. CHAPMAN, 306 Oriental Bldg., SEATTLE, WASH.

KEYSTONE DRILLING PLANT FOR LEASE OR SALE.

Second-hand No. 2 Keystone Drill, together with some tools and tubing. Machine is near Helena, Mont. Address

D. B. Huntley, Helmville, Mont. 77.

GAS ENGINE.

80 h. p. tandem, two cylinder, "Standard" GAS ENGINE. Guaranteed **Good as New.** Inspection invited. Ready for **Immediate Delivery.** Will sell for less than **One-Half Cost.** For Sale by

THE F. BISSELL CO., TOLEDO, O.

FOR SALE:

Gold, Copper & Silver Lead Properties Anywhere in the United States. Also valuable timber tracts in British Columbia.

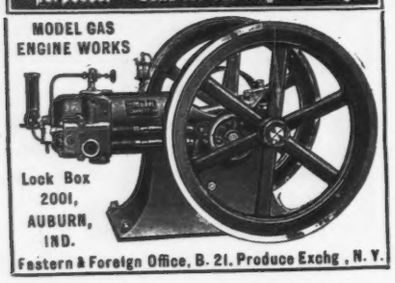
J. P. RAY, 315 Occidental Ave., Seattle, Wash.

INVESTORS

desiring to realize the Large Interest and Profits possible in legitimate Mining, Oil, Timber and Smelter Investments and Dividend-paying Industrial Stocks, listed and unlisted, should send for our Booklets, giving full information. Mailed free.

DOUGLAS, LACEY & CO.,
Bankers and Brokers, 66 Broadway, N. Y.

MODEL Gas, Gasoline, Kerosene and Distillate Engines
2 to 100 H. P. for Stationary, Portable, Electric Lighting, Pumping and Hoisting purposes. Send for our large Catalog.



Lock Box 2001, AUBURN, IND.
Eastern & Foreign Office, B. 21, Produce Exchg., N. Y.

INDUSTRIES ARE OFFERED LOCATIONS

WITH

Satisfactory Inducements, Favorable Freight Rates, Good Labor Conditions, Healthful Communities,

ON THE LINES OF

THE ILLINOIS CENTRAL R. R. and the YAZOO & MISSISSIPPI VALLEY R. R.

For full information and descriptive pamphlet address

J. C. CLAIR, Industrial Commissioner
1 PARK ROW, CHICAGO, ILL.

MANUFACTURERS

Contemplating establishing plants in the West should take advantage of a location on

THE NORTH-WESTERN LINE

Chicago & North-Western Ry.
which reaches the famous

**WATER POWERS,
COAL FIELDS,
IRON ORE RANGES,
HARD AND SOFT
LUMBER DISTRICTS,
MINING DISTRICTS**

of the West and Northwest, and affords the best means of transportation to the markets of the world.

FOR FURTHER PARTICULARS APPLY TO
MARVIN HUGHITT, Jr., Freight Traffic Manager, E. D. BRIGHAM, Gen'l Freight Agent,
GEO. BONNELL, Industrial Agent,
NW513 CHICAGO.

Wainwright Feed Water Heaters

Expansion Joints. Send for catalogue No. 6.

ALBERGER CONDENSER COMPANY.
Branch Office
205 La Salle Street, Chicago. 95 Liberty Street, New York.

NOW READY.

Elements of Mining, Geology and Metallurgy.

By G. W. MILLER.

THE latest work on the subject. Concentrating in compact form an inexhaustible amount of useful and practical material, gathered by the author in his trips through the various mining camps of North and South America, South Africa, Asia, Australia and Continental Europe. An exceptionally handy compend for all practical men who are too busy to delve into long winded and academic volumes. Written in plain English with a grateful absence of technical phrases. Replete with numerous illustrations, figures, diagrams and working drawings. Altogether combining a complete modern technical library of treatises boiled down into a single volume of moderate size.

TABLE OF CONTENTS.

Chapter
I—Elements of Mining Geology
II—Occurrence and Metallurgy of Iron.
III—Descriptive Geology of Gold and Silver.
IV—Testing and Assaying of Gold and Silver Ores.
V—Stamp Milling and Mill Construction.
VI—Treatment of Gold and Silver Ores by the Cyanide Process.
VII—Descriptive Geology of Copper.
VIII—Assaying and Smelting of Copper.
IX—Lead—Geology, Assaying and Smelter Design.
X—Zinc—Geology, Assaying and Metallurgy.
XI—Rarer Metals and Minerals.
XII—U. S. Mining and Patent Laws and Glossary of Mining Terms.

Flexible leather, 504 pages and 350 illustrations.

Price $3.50 (postpaid).

THE ENGINEERING AND MINING JOURNAL
505 Pearl Street, New York
20 Bucklersbury, London, E. C.

L. MANASSE
88 Madison St., Tribune Building
CHICAGO, ILL.
Civil Engineers' and Surveyors' Supplies
Optical Instruments of every description, Barometers, Thermometers, Field Glasses, etc. Catalogue on application.

PRACTICAL NOTES
ON THE
CYANIDE PROCESS

By FRANCIS L. BOSQUI

A useful book, containing exemplifications of practice in United States, Africa and Australia.

Prepaid, $2.50

The ENGINEERING and MINING JOURNAL
505 PEARL STREET, NEW YORK

A SHORT MANUAL OF ANALYTICAL CHEMISTRY, QUALITATIVE AND QUANTITATIVE—INORGANIC AND ORGANIC.

By JOHN MUTER

A concise manual designed for those who are interested in the salient developments of analytical chemistry from the simplest operations upwards, and including many organic questions generally omitted in other books. This treatise will enable a student to become familiar with a great variety of processes which would prove of the greatest advantage to him in his researches and experiments. 8vo, cloth. Illustrated.

PRICE, $2.50

The Engineering & Mining Journal
505 PEARL ST., NEW YORK

USEFUL TECHNICAL TREATISES IN BINDERY.

ORDER NOW

THE MINERAL INDUSTRY

Its Statistics, Technology and Trade

In the United States and other countries, to the end of

1905

VOLUME XIV

SUPPLEMENTING VOLS. I TO XIII

Edited by W. R. Ingalls

$5.00 (or 21 Shillings) Postpaid

The above technical treasury (recording the statistics for 1905) is now in active course of preparation, under the direct supervision and personal guidance of Walter Renton Ingalls, the editor of THE ENGINEERING AND MINING JOURNAL. The forthcoming volume will incorporate all of the features that made the earlier annual issues especially valuable, including full statistics of the mineral and metallurgical industries of the entire world, besides containing complete tables summarizing production, imports and exports of foreign countries, brought down to the latest possible date, together with exhaustive reviews of technical progress, by eminent authorities in each particular branch. This notable annual is the universally acknowledged supreme authority on all questions applying to mining, metallurgy and the chemical arts. The book will be ready for general delivery July 1st and it would be wise to send order for the same now, so that prompt shipment can be made.

LEAD SMELTING AND REFINING

Edited by W. R. Ingalls.

A splendid collection of important articles on Lead Smelting and Refining by eminent authorities, reprinted from the numerous contributions on the subject which have appeared in THE ENGINEERING AND MINING JOURNAL for the past three years. The present compilation concentrates in compact form a vast amount of literature applying to the industry, and also incorporates elaborate descriptions and accounts of the new processes of lime-roasting, including the Huntington-Heberlein, the Carmichael-Bradford and the Savelsberg experiments. The volume is up-to-date in every detail, and conveys comprehensively the progress and advancement made in other branches of lead smelting that has been developed in the recent past. It embodies valuable information which will materially assist the lead smelter when perplexing problems confront him, and altogether the treatise will prove of the greatest practical utility to all smelters and metallurgists.

Table of Contents.

Chapter
I—Notes on Lead Mining.
II—Roast — Reaction Smelting in Scotch Hearths and Reverberatory Furnaces.
III—Sintering and Briquetting.
IV—Smelting in the Blast Furnace.
V—Lime-Roasting of Galena.
VI—Other Methods of Smelting.
VII—Dust and Fume Recovery, Including Flues, Chambers and Bag-Houses.
VIII—Blowers and Blowing Engines.
IX—Lead Refining.

Octavo cloth, freely illustrated, including numerous diagrams and drawings.

Price $3.00 (Postpaid.)

NOTES ON METALLURGICAL MILL CONSTRUCTION.

Edited by W. R. INGALLS.

The material embodied in this useful compend consists of a complete reproduction of the various articles and papers on modern practice in mill construction in its many phases, which have appeared at various times in the columns of the Engineering and Mining Journal. The subject has been handled exhaustively by eminent experts in the mining profession, and has also undergone a most thorough and careful revision by Walter Renton Ingalls, the editor. The data in its new and improved form combines in comprehensive style every detail involved in the construction of concentration mills, cyanide plants and smelting works. The volume is copiously illustrated, including numerous diagrams, which will prove of great practical value to all millmen and smelters.

Table of Contents.

Chapter.
I.—Brickwork and Concrete.
II.—Building Construction.
III.—Ore Crushing Machinery.
IV.—Dryers and Drying.
V.—Conveyors and Elevators.
VI.—Disposal of Tailings.
VII.—Miscellaneous.

Octavo Cloth. Price $2.00 (Postpaid.)

Producer Gas and Gas Producers

BY SAMUEL S. WYER.

The latest and most thoroughly complete treatise on the subject of gaseous fuels. The use of fuel gas has attracted considerable attention for many years, and the important advances and industrial developments made therein will be found minutely contained in this intelligent volume. The author is acknowledged by the profession to be one of the highest experts on the question, and his numerous experiments will no doubt prove interesting as well as useful to all chemists, metallurgists, gas engineers, and others who wish to keep themselves posted in an important branch in metallurgy.

CHAPTERS.	
I	Fundamental Physical Laws and Definitions.
II	Fundamental Chemical Laws and Definitions.
III	Thermal and Physical Calculations.
IV	Commercial Gases.
V	Status of Producer Gas.
VI	Classification of Gas-Producers.
VII	Manufacture and use of Producer-Gas.
VIII	Use of Steam in Gas-Producers.
IX	Carbon Dioxide in Producer-Gas.
X	Efficiency of Gas-Producers.
XI	Heat Balance of the Gas-Producer.
XII	Fuel.
XIII	Requirements.
XIV	History of Gas-Producers.
XV	American Pressure Producers.
XVI	American Suction Gas-Producers.
XVII	Gas-Cleaning.
XVIII	By-Product Gas-Producers.
XIX	By-Product Coke Oven Gas-Producers.
XX	Producer-Gas for Firing Ceramic Kilns.
XXI	Producer-Gas for Firing Steam Boilers.
XXII	Wood Gas-Producers.
XXIII	Removal of Tar from Gas.
XXIV	Gas-Producer Power-Plants.
XXV	Operation of Gas-Producers.
XXVI	Testing Gas-Producers.
XXVII	Future of the Gas-Producer.
XXVIII	Gas-Poisoning.
XXIX	Reference Data.
XXX	Bibliography.

Crown octavo Cloth, profusely illustrated, including numerous Working Drawings.

PRICE $4.00 (17 s) POSTPAID.

A useful book for all Metallurgists.

INDUSTRIAL FURNACES

BY PROF. EMILIO DAMOUR

Translated and augmented by A. L. QUENEAU.

An exceptionally intelligent treatise on the subject, and also an advantageous companion volume to the recently issued work on Producer Gas and Gas Producers by S. S. Wyer. The above manual has been translated with remarkable ability from the original French of Prof. Emilio Damour by A. L. Queneau, and incorporates a vast amount of fresh and comprehensive data in relation to industrial furnaces—their deficiencies, possibilities and the various advances and improvements made in the principal contrasted types. The present treatise represents the combined efforts and experiments of two distinguished experts in their especial practice, and no chemist, metallurgical engineer or other workers in the industry can afford to be without it.

CHAPTERS
I.—Heat of Combustion and Calorific Power.
II.—Origin and Rapid Development of Gas Furnaces.
III.—Influence of the Temperature on the Heat Utilization in a Furnace.
IV.—Characteristics of Direct-Fired Furnaces and Their Industrial Applications.
V.—First Group of Gas-Fired Furnaces.
VI.—Second Group of Gas-Fired Furnaces.
VII.—Furnaces Making Use of the so-called Regeneration of the Products of Combustion.
VIII.—Classification of the Various Types of Furnaces.
IX.—Experimental Study of the Heat Utilization in Furnaces.
X.—Discussion of the Theory of Heat Recuperation in the Light of Experimental Data.
XI.—Pyrometric Practice and Instruments.
XII.—Gas Analysis. Sampling. Sampling Tubes. Water-Vapor Determination. Tests.
XIII.—Calorimetry.
XIV.—Elementary Fuel Analysis. Determination of Elements.
XV.—Chimneys. Consideration and Details of Construction.
XVI.—Regenerators. Velocities and Sojourn of Gas Currents in Regenerative Furnaces.
XVII.—Recuperators. Details.
XVIII.—Reversing Valves. Hearth.
XIX.—Powdered Fuel. Coal-Dust Stokers. Details.
XX.—List of U. S. Patents Covering the Stoking of Powdered Fuel.
XXI.—Conversion Tables.
Bibliography.

Crown Octavo Cloth, profusely illustrated, including numerous Working Drawings.

PRICE $4.00 (17 s) POSTPAID.

The Engineering and Mining Journal

505 Pearl Street, New York **20 Bucklersbury, London, E. C.**

DRILL STEELS MADE OF

International

HIGH GRADE CRUCIBLE

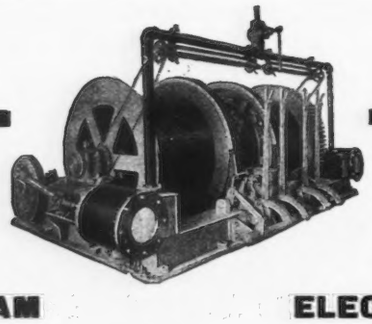
ROLLED HOLLOW DRILL STEEL

HAVE NO WELDS, consequently THEY DO NOT BREAK. The hole is ROLLED, not drilled, in the BAR, consequently the steel is STRONGER and TOUGHER and of a UNIFORM TEMPER. ANY LENGTH, SIZE OR SECTION. Ask your DRILL MAKER for it, or write to us for particulars.

MADE ONLY BY

International High Speed Steel Co.

Fox Bldg., Franklin Square, New York City.



STEAM **ELECTRIC**

HOISTS

Efficient, Durable, Machinery. Reasonable Prices.

The Dillon Iron Works Co.

Denver, Colo., U. S. A.

Engineers **Manufacturers**

Mining and Milling Machinery

ALPHABETICAL INDEX TO ADVERTISERS

	PAGE
Abadie Emile Rector	50
Abbé Engineering Co	17
Abel & Co., C. C	59
Abendroth-Root Mfg. Co	80
Adams, Henry	50
Adams, W. H	50
Additon, A. Sydney	50
Aetna Foundry & Machine Co	2
Aetna Powder Co., The	65
Ainsworth, Wm	1
Akers, W. A	50
Alberger Condenser Co	42
Aldridge, W. H	50
Alsing Co., J. R.	24
Allen, H. A.	50
Allen, W. W	50
Allentown Rolling Mills	63
Allgemeine Elektricitats-Gesellschaft	
Allis-Chalmers Co	4
Almy Water-Tube Boiler Co	
Aloe Co., A. S	77
Alteneder & Son, Theo	76
American Air Compressor Works	66
American Bridge Co	23
American Brake Shoe & F'dry Co.	66
American Concentrator Co	15
Amer. Diamond Rock Drill Co.	73
American Injector Co	62
Amer. Mfg. Co	
American Metal Co	39
American Oil and Paint Co	
American Portable House Co	
American Process Co	79
American Railway Supply Co	48
American Safety Lamp & Mine Supply Co	63
American Spiral Pipe Works	81
American Water Softener Co	
American Well Works	70
Anderson, R. H	51
Antisell & Corr	51
Anton & Brother, G	71
Archer Iron Works	33
Arizona Copper Co	58
Arizona & Sonora Mfg. Co	33
Armstrong, L. K	51
Armstrong Manufacturing Co	66
Arnett & Co., W. D	51
Arthur, Jr., E. P	51
Atkinson, I. B	51
Atlantic Equipment Co	28
Atlantic Mining Co	58
Atlas Engine Works	
Atwater, Jr., R. M	51
Auburn Ball Bearing Co	75
Austin, Robert A	
Austin Manufacturing Co.	32
Ayres, W. S	51
Babb P. A	51
Bacon, E. C	32
Baerwald, E	39
Bagg, Rufus M	51
Baker & Co., Inc	62
Baker & Adamson Chemical Co	34
Bakewell, T	59
Balbach Smelting & Refining Co	39
Baldwin Locomotive Works	21
Baltimore Copper Smelting & Rolling Co	82
Bandmann, C. J	51
Bard, D. C	51
Barker & Wilson	51
Bartlett & Snow Co	72
Baszanger & Co., J	72
Bath & Son, Henry	39
Beagle Hame Works	
Beardsley, G. F	51
Beatty, A. Chester	51
Beeler, Henry C	51
Berger & Sons, C. L	77
Bergstrom O	51
Berwind White Coal Mining Co	58
Best Manufacturing Co	
Betts, Anson G	34
Bible & Sully	51
Bishop & Co., J	48
Bissell Co., F., The	42
Blackwell Son's Co., George G	61
Blaisdell Co	78
Blake Mining & Milling Co., The	62
Blauvelt, Harrington	51
Bleichert & Co., Adolf	
Blow, A. A	51
Boggs, G. W	57
Boggs, Jr., W. R	51
Bonthrone, B	51
Booth, Garrett & Blair	34
Borrowe, G. W	51
Bosqui, F. L	51
Brackett, F. E	51
Bradley Engine Works	40
Bradley, D. H. Jr	51
Bradley, F. W	51
Braeburn Steel Co	73
Brandes, J. F	51
Brandis Sons & Co., F. E	76
Braschi, Victor M	51
Braun Co., F. W	32
Brewer, W. M	51
Bristol Co., The	84
Bristol, Wm. H	84
Britannia Smelting Co., The	82
Brockman & Co., E. T	51
Broderick & Bascom Rope Co	19
Brodie, Walter M	51
Brown Brothers	
Brown, Cony T	51
Brown Hoisting Machinery	78
Brown, Robert Gilman	51
Brown, W. G	51
Bruner & Co., R. E	58
Buck, Rufus	51
Bucyrus Co	69
Buff & Buff Co	76
Buffalo Steam Pump	
Buffalo Forge Co	31
Burch, A	51
Burger C. C	51
Burlingame & Co., E. E	57
Burnham-Standeford Co	71
Burton, Howard E	57
Bury Compressor Co	84
Caldwell & Son Co., H. W	81
Canby, R. C	51
Carbolineum Wood Preserving Co.	
Carlson Exploration Co	51
Carnahan Mfg. Co., C. T	11
Carpenter & Brennon	51
Carpenter & Co., Chas. W	57
Carpenter, F. B	51
Carter Auto-Magnetic Ore Separator Co	62
Carterville Foundry & Mach. Co.	30
Castner, Curran & Bullitt	58
Cates, L. S	51
Catlin & Powell Co	58
Chalmers & Williams	3
Channing, J. Parke	51
Chapman, N. W	42
Charleton, Dickinson & Co	51
Chase, Edw. E	51
Chicago, Burlington & Quincy R R.	67
Chicago House Wrecking Co	40
Chicago & N. W. R. R	42
Chicago Pneumatic Tool Co	71
Chicago School of Assaying	
Chisholm, Boyd & White Co	
Chisholm, Matthew & Co	3
Chrome Steel Works	68
Church, John A	52
Church, L. C	52
Clark Brothers	40
Clarke, Roy H	52
Claypool, W. M	52
Clayton Air Compressor Works	71
Clements, J. Morgan	52
Cleveland Car Co	66
Cling Surface Co	
Coast Mfg. & Supply Co	
Collins, George E	52
Colo. Iron Works Co	22
Colo. Midland R. R	60
Colo. & Southern R. R	
Colonial Portable House Co	
Columbia Engineering Works	68
Comstock, Theo. B	52
Commercial Electric Co	66
Connersville Blower Co	68
Consolidated Pipe Co	
Conner, J. N. A	52
Constant, C. L	52
Cook's Sons, Adam	48
Cook, A. D	
Craig, W. J	58
Crane Co., The	72
Crawford & McCrimmon Co	31
Crawford, W. H	52
Cresson Co., G. V	30
Crippen Manufacturing Co., H. D.	73
Critchett & Ferguson	57
Crocker-Wheeler Co	45
Crosby, W. O	52
Crown Drilling Mach Co., The	75
Cyclone Drill Co	75
Daggett, Ellsworth	52
Danville Foundry & Machine Co.	31
Davis & Son, G. M	81
Davis Iron Works Co., The F. M.	49
Dayton Globe Iron Works Co	79
Dearborn Drug & Chemical Co	24
Defty, W. E	52
De Kalb, Courtenay	52
De La Vergne Machine Co	49
De Lamar Copper Refining	83
Deane Steam Pump Co., The	
Deming Co., The	72
Demming, H. C	52
Denny, G. A	52
Denver & Rio Grande R. R	48
Denver Balance Co	76
Denver Engr. Works Co	8
Denver Fire Clay Co	29
Denver Laboratories	67
Denver Ore Testing and Sampling Co	57
D'Este Co., Julian	48
Dessau's Son, S	79
Detroit Leather Specialty	2
Detroit Lubricator Co	60
De Vore, E. H	52
Dickman & MacKenzie	52
Dietzgen, Eugene Co	76
Diggles, J. A	52
Dikeman, J. M	52
Dillon Iron Works Co	44

ALPHABETICAL INDEX TO ADVERTISERS

	PAGE
Dings Electro-Magnetic Separator Co.	62
Dixon Crucible Co., Jos.	74
Doble Co., Abner	79
Doran, J. J.	
Douglas, Lacey & Co.	42, 59
Doveton & Purington	52
Draper, T. Waln-Morgan	52
Dufourcq, E. L.	52
Du Pont Co., E.	65
DuPont Co.	65
Dwight, A. S.	52
Dwight Engineering Co.,	52
Eastern Machinery Co.	
Easton, S. A.	52
Eberenz, Geo. B.	57
Edson Mfg. Co.	74
Edwards, H. W.	52
Eimer & Amend	77
Elftman & Cull	52
Elliott's Metal Co.	82
Elmer, William Wells	52
Emmens, N. W.	62
Emerson Steam Pump Co.	72
Emmerton, F. A.	62
Engelbach-Reynolds Mch. Co.	64
Eng. Works of Wonham & Magor.	33
Erie Railroad Co.	60
Esselstyn, J. N.	52
Evans, C. W.	52
Evans, J. W.	52
Excelsior Wooden Pipe Co.	80
Fairbanks Morse Co.	66
Fairchild, O. H.	52
Faikenau Assaying	57
Farish, J. B.	52
Fearn, Percy L.	52
Ferrier, W. F.	52
Finch, J. W.	52
Fisk, Winthrop W.	52
Flory Mfg. Co., S.	84
Foote Mineral Co.	18
Forbes, D. G.	52
Fowler, S. S.	52
Franke, E. A.	52
Fraser & Chalmers, Ltd.	63
Freeman Foundry & Mfg. Co.	64
Freese & Co., E. M.	33
Frese Optical Co.	77
French, G.	52
Frenier & Son, J. H.	62
Frenzel, A. B.	52
Galena Iron Works	62
Gandy Belting Co.	
Gardner & Shearer	52
Garthwaite, E. H.	53
Garvin Cyanide Extraction Co.	
General Electric Co.	46
General Securities Co., The	59
Gilchrist, P. S.	53
Gilkerson, H. G. & E. W.	53
Goodman Mfg. Co.	
Gordon & Chippendale	53
Granby Mng. & Smelting Co.	
Granite Securities Co.	58
Grant, R. J.	53
Greene Consolidated Copper Co.	58
Green Fuel Economizer Co.	61
Greenley, L. A.	53
Grothe, O.	53
Gunn, Geo. E.	53
Gurley, W. & L. E.	76
Hadfield's Steel Foundry Co.	
Haas, Herbert.	53
Haggen, Edw. A.	53
Hall Motor Vehicle Co., The	
Hallidie Painter Tramway Co.	67
Hamer, A. T. E.	53
Hammond, John Hays.	53
Hammond Iron Works	81
Hanks, Abbott A.	57
Hanna Mfg. Co.	76
Harbison-Walker Refractories Co.	71
Hardsocg Mfg. Co., M.	
Hardsocg Wonder Drill Co.	12
Harmon Lumber Co., S. H.	
Harrington & King Perf. Co.	62
Harrisburg Foundry & Machine Works.	
Harris, F. S.	53
Harvey, F. H.	53
Hayward Co., The	
Hazard Manufacturing Co.	67
Heil Chemical Co., Henry	76
Heine Safety Boiler Co.	68
Helm, J. D.	53
Heller & Brightly	76
Heller & Wright	53
Hendrick Mfg. Co.	61
Hendrie & Bolthoff Mfg. & Supply Co.	23
Henshaw, Bulkley & Co.	26
Herman, A.	58
Herzig, C. S.	53
Herr, H. B.	53
Hewett Carstarphen Co.	53
Hewitt, G. C.	
Heywood, W. A.	53
Higbee, R. B.	42
Hill, F. A.	53
Hill, Robt. T.	53
Hills & Willis.	53
Hitner's Sons, H. A	40
Hobson & Co., F. J	53
Hodge, Benjamin.	53
Hoegee, Co., W. H.	
Hofius Steel & Equipment Co.	
Hoffman, R. B.	53
Holbrook Co., J.	
Holden, Edwin C.	53
Holmes, G. L.	53
Holms, W. L.	53
Holland, C. H.	53
Holland, L. F. S.	53
Hollis, H. L.	53
Hollow, J. T.	53
Hoskins Co., The	30
Hug Water Wheel Co., The	79
Hughes, Thomas	53
Hunt Co., C. W.	84
Hunt, Ellery W	53
Hunt & Co., R.	53
Huntley, D. B.	53
Hutchins, J. B.	53
Hutchinson, W. S.	53
Illinois Central Railroad	42
Illinois Zinc Co.	2
Indianapolis Switch & Frog Co., The	67
Ingersoll-Rand Co.	13
Int'l Acheson Graphite Co.	69
Int'l High Speed Steel Co.	44
Iron City Steel Co.	40
Jamme, Geo., Jr.	53
Janin, Charles.	53
Janin, Stebbins & Smith.	53
Jeanesville Iron Works Co.	
Jeffrey Manufacturing Co.	7
Jenks, A. W.	53
Jenkins Bros.	84
Jennings E. P.	53
Johns-Manville Co.	61
Johnson Iron Co.	74
Johnston, R.	83
Johnston, Thos.	84
Jones, C. C.	53
Jones, Dan.	59
Jordan & Co., Stanley	39
Juessen, E.	53
Kedzie, G. E.	53
Kelley Machinery Co., R.	
Kelly & Chapman.	53
Kempton, C. W.	53
Kennedy, J.	54
Kent Mill Co.	30
Keuffel & Esser Co.	76
Keystone Driller Co.	75
Kilbourne & Jacobs Mfg.	26
King, Jacob.	54
King, L. M.	54
Kirby, Edmund	54
Klepetko, Frank	54
Klipstein & Co., A.	39
Knight & Co.	
Knox & Allen.	53
Knox, Newton B.	53
Knox, Schlapp &	53
Kohlbusch, H.	34
Kolesch & Co.	
Koppel, A.	67
Krogh Mfg. Co.	
Krupp, F. Grusonwerk	25
Kyle & Co., T. D.	57
Laclede Fire Brick Mfg. Co.	47
Lagonda Mfg. Co., The	
Laidlaw, Dunn, Gordon Co.	
Laird, G. A.	54
Lake Erie Boiler Compound Co.	48
Lammers, Theo. L.	54
Landes, H.	54
Lawrence, Benj. b.	54
Lawrence, T. J	54
Ledoux & Co.	34
Lee & Co., Jas.	34
Lefevre, H. F.	54
Leggat, Alexander.	54
Leffel & Co., Jas.	80
Leggett, Thos. H.	54
Leonard & Root.	57
Leschen & Sons Rope Co., A.	
Lewis & Co., H. F.	2
Leyner Engr. Co., J. Geo.	47
Lidgerwood Mfg. Co.	32
Lidner, P. G.	54
Lima Loco. & Mach. Co.	69
Lineberger & Rone.	54
Link Belt Mach. Co.	68
Lisboa, M. A. R.	54
Littlefield, J. F.	54
Lloyd R. L.	54
Lombard Governor Co.	
Long, F. H.	54
Loring, Frank C.	54
Loring, W. J.	54
Ludlow Saylor Wire Co.	63
Lufkin Rule Co.	76
Luitwieler Pumping Engine Co.	
Lukis, Ernest du B.	54
Macbeth Fuse Works.	70
MacDonald, B.	54

STAYBOLTS

of Nickel Steel

Resist Vibration.

NICKEL FOR
NICKEL STEEL

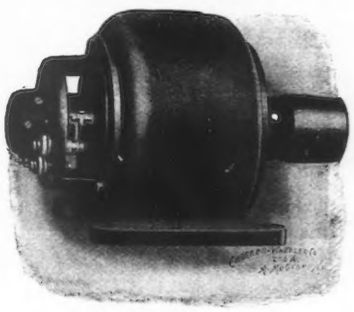
WRITE US FOR INFORMATION.

The Orford Copper Co.

NICKEL REFINERS,

43 Exchange Place, New York.

UNMATCHED



THE FORM L MOTOR, Sizes from 1-4 to 3 H.P.

Although our Form L MOTOR has been on the market more than two years, no competitor has been successful in matching it.

Thousands of these sturdy little workers are economically driving fans, pumps, blowers, hoists, grinders, conveyors, etc., etc.

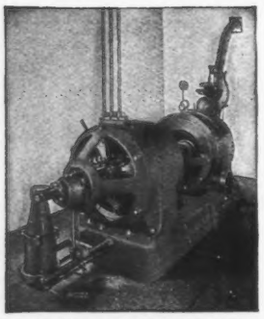
Easy to install and operate. Send for Bulletin No. 60 P.

CROCKER-WHEELER
COMPANY,
Ampere, N. J.

General Electric Company

Curtis Turbine Generators for Direct Current.

15 to 300 Kw.



Curtis Steam Turbine Generator Set C—4—75—2400—Form T, 125 Volts.

In operation these generating units notably differ from others.

No cylinder or other internal oil is used, hence the exhaust steam is perfectly clean and may be used for heating and returned to boilers.

The turbine is not injured by water drawn from boiler.

It may be operated with superheated steam.
It is easily changed for efficient operation with different steam pressures.

Immediate shipments of 25 Kw. Units.

944

Principal Office: Schenectady, N. Y.

New York Office: 44 Broad St.

Sales offices in all large cities.

Chas. C. Moore & Co.
Engineers

Contractors for Complete Plants.

POWER **MINING**
LIGHTING **PUMPING**

Due to the awful calamity which visited San Francisco, we have been obliged to open temporary offices at

417-14th St., Oakland and 3100 Washington St., San Francisco.

Permanent offices now being arranged.

Building in San Francisco. Notice Later.

All Correspondence received will have immediate attention.

ALPHABETICAL INDEX TO ADVERTISERS

	PAGE
Mackinnon, J. M	
Mahn & Co.	76
Main Belting Co.	78
Malcolmson, J. W.	54
Manasse, L.	42
Mandell, F. C.	54
Mansfield, H. M.	54
Marsters, V. F.	54
Marvin Elec. Drill Co.	72
Mathis, T. S.	54
Mathison & Co.	39
Matthiessen & Hegeler Zinc Co.	82
Maynard, Geo. W.	54
McCabe & Co., P. B.	16
McCaustland, E. J.	54
McClelland, J. F.	54
McCord, W. H.	54
McCoy, Percy B.	53
McCullough, A.	83
McCullough Co., W. L.	29
McEwen, Arthur & McEwen	54
McGaha Co., W. P.	83
McKiernan Drill Co.	71
McLanahan-Stone Mach. Co.	30
McLennan, J. F.	54
Meckienburg Iron Works.	30
Megraw, H. A.	54
Mendez & Co., J. J.	59
Merrill, F. J. H.	54
Messiter, E. H.	54
Metallic Cap Mfg. Co.	81
Metallurgical Labora., The.	54
Mich. Pipe Co., The.	80
Mich. College of Mines.	59
Milwaukee Bridge Co.	2
Millen, J. D.	54
Miller, I.	54
Miller, W. Clayton	54
Minard, Fredk. H.	54
Mines Contract & Investigation Co. of Toronto.	59
Mine & Smelter Supply Co., The	22
Miners' Assay Office	57
Mines Finance Co.	58
Minneapolis Steel & Mach Co.	75
Mitchell, D. P.	54
Mitchell, Geo.	58
Mitshkun Co., M.	69
Model Gas Engine	42
Molson, C. A.	54
Montana State School of Mines.	59
Morava Construction Co.	68
Morgan, Donald R.	54
Morgan-Gardner F'	
Moore & Co., C. C.	46
Morris Mach. Works	70
Morrow, J. T.	54
Morse, Williams & Co.	
Mountain Copper Co., Ltd., The.	39
Mudd, S. W	55
Musgrave, E. C.	55
Nahl, A. C.	55
Nason, F. L	55
National Aniline & Chemical Co.	67
National Wood Pipe Co	81
Neill, James W	55
Nevada Agency & Trust Co.	59
New Standard Concentrator Co.	16
Newaygo Portland Cement Co.	69
Nichols Copper Co.	30, 39
Nichols, Ralph	55
Nicholson, Frank	55
Nicholson, H. H.	55
Nissen Engineering	55
Nitro Powder Co	65
Nixon & Kimmel	40
Nordberg Mfg. Co	64
Norris, J. L.	84
Northern Elec. Mfg. Co.	60
Norwalk Iron Wks. Co	71
Nourse, C. F	55
Noyes, W. S.	55
Occidental Machinery & Eng. Co.	61
Officer & Co., R. H	57
Ogden Assay Co.	58
Olcott, Corning	55
Orford Copper Co.	45
Overstrom, Gustav A.	55
Pacific Coast Pipe Co.	
Pacific Tank Co	83
Packard, G. A.	55
Parker & Park	55
Parrish, S. F	55
Pass & Son, C.	82
Peacock, S.	55
Pearse, Kingston & Browne	55
Pellew, Harvey & Fell	55
Pelton Water Wheel Co.	79
Penn. Smelting Co.	34
Perine, H. B.	81
Perrin & Co.,	68
Perry, O. B.	55
Peters, E. D.	55
Peterson, Bert.	55
Pettit, A. E.	55
Phelps, Dodge & Co.	58
Phillips, & Co., W. B.	55
Phosphor Bronze Sm. C	
Pioneer Roll Paper Co.	
Pitkin, Lucius	34
Polytechnic Business College	
Pomeroy, W. A.	55
Porter Co., H. K.	69
Portland Cordage Co.	40
Powell, J. R.	
Powell Co., The Wm.	84
Power & Mining Mach. Co.	6
Prescott Steam Pump Co.	72
Price Pump Co., G. W	
Prichard, W. A.	55
Pritchett C. W.	55
Probert, F. H.	55
Proske, T. H.	84
Puget Sound Metals Co.	41
Pulsometer Steam Pump Co.	74
Purdue, A. H.	55
Putman & Co., H. J	
Queneau, A. L.	55
Railway Steel Spring Co.	72
Ralston, J. C.	55
Rand, C. D.	58
Randolph, John C. F.	55
Rapid Economy Stamp Mill Co.	
Ray, J. P.	42
Raymond, Rossiter W	55
Rebbeck, J. K.	55
Redwood Mfrs. Co	2
Reed, D. C.	55
Restein & Co., C.	64
Revett, Ben Stanley.	55
Rice, L. M.	55
Richardson Bros. Co.	59
Richards, H. de C.	55
Richards, R. H.	55
Richardson & Co., Inc.	40
Ricketts & Banks.	34
Riebe & Co., E. C.	39
Riebling, H. F. A.	55
Rife Ram Co.	33
Riordan, D. M.	55
Risdon Iron Works	28
Robbins, P. A.	55
Robins Conveying Belt Co.	83
Robinson, G. H.	55
Robinson Machine Co	69
Robison & Lastinger	59
Roebling's Sons Co., J. A.	67
Roessler & Hasslacher Chem. Co.	34
Rogers, A. H	55
Rogers, A. P.	55
Rogers, E. M	55
Rohlfing, D. P.	55
Rombauer, A. B.	55
Ross-Tacony Crucible Co.	68
Rose Polytechnic Institute	66
Roote, G. J.	55
Roots Co., P. H. & F. M	
Roy & Titcomb, Inc.	33
Ruehle & Co., E. G.	
Rutledge, J. J.	56
Saginaw Manufacturing Co.	48
Salt Lake Hardware Co., The	77
Sanders, W. E.	56
Sanford-Day Iron Works	26
Schiertz, F. A.	56
Schneider & Co., E.	
Schroter, G. A	56
Schwarz, Theodore F.	56
Scobey, Jesse C.	56
Scott, Herbert K.	56
Scottish Cyanide Co.	72
Seamon, W. H.	56
Sebben, E. W.	56
S. H. Supply Co.	40
Sharpless, F. F.	56
Shaw, R. C.	56
Shipman, H. A.	56
Shriver & Co., T	68
Shultz Belting Co.	49
Siggers & Siggers.	84
Simonds Co., F. K.	81
Simonds & Wainwright	56
Sizer, F. L	56
Slipp-Butler C	58
Smith, A. M.	56
Smith, Emery & Co.	57
Smith, Howard D.	53
Smith Co., S. Morgan.	79
Smith, Franklin Wheaton	56
Smith, Parker & Boyd	75
Smith, T. J.	59
Smooth-On Ma	70
Smedaker, J. A	56
Soltmann, E. G.	77
Solvay Process Co.	61
South Dakota School of	48
Spackman Eng. Co., H. S.	56
Spalding, E. P	56
Spilsbury, E. G.	56
Sprague Electric C	21
Stadelmann, G	56
Stanford, R. B	56
Standard Diamond Drill Co	73
Star Machinery Co.	
Starrett Co., The L. S.	76
Stebbins, Elwyn W.	58
Stephens Adamson M'f'g.	47
Stephens, A. H	56
Stevens, A. W.	56
Stevens, W. A.	56

ALPHABETICAL INDEX TO ADVERTISERS

	PAGE
Stine & Son, S. B.	66
St. Joseph Lead Co.	82
St. Louis Smelting & Ref. Co.	82
Stoddard Incorporating Co	59
Stonestreet, G. D.	56
Stow, A. H.	56
Stowell Manufacturing Co.	
Straus & Co., L.	39
Stromberg Carlson Telephone Manufacturing Co.	31
Sturges, W. M.	73
Sturtevant Mill Co	14
Sturtevant Co., B. F.	28
Sullivan Machinery Co.	9
Sustersic, Ferdinand	56
Sussmann, O.	56
Swann & McCain Co.	56
Swoyer & Van Dreveldt	56
Syphers Machinery Co.	31
Syracuse Smelting Works	82
Tacoma Smelting Co.	82
Tanner, W. N.	56
Tay Co., G. H.	
Taylor Iron & Steel Co.	29
Tays, E. A. H.	56
Tennessee Iron Works	29
Thayer, B. B.	56
Thew Automatic Shovel Co.	78
Thompson & Gilliam	56
Thomson & Boyle	79
Thyng, Wm. S.	56
Tibbals, W. H.	84
Timmons, C.	56
Titus, N. C.	56
Toll, R. H.	56
Tomlinson & Norton	56
Tonking, J. B.	56
Townsend, A. R.	56
Townsend, J. R.	59
Traylor Engineering Co.	10
Traylor & Co., J. A.	27
Treadwell, J. C.	56
Trego, F. H.	56
Trent, L. C.	56
Trenton Iron Co	
Troemner, H.	77
Turner & Gates	56
Tuttle, E. G.	56
Tyack, M. H.	82
Tyee Copper Co., The	82
Tyrrell, J. B.	57
Ulmer & Co., J. C.	76
Union Assay Office	57
Union Elevator & Mach. Co.	74
United Iron Works Co.	62
United Metals Selling Co.	39
United States Smelting and Refining Co.	
Utah Mining Mach. & Supply Co.	20
Utah State School of Mines	59
Vanadium Alloys Co.	2
Vajen-Bader Co	81
Vogelstein, L., & Co.	39
Voigt, B.	
Voland & Sons	77
Von Leer, I. W.	57
Vulcan Iron Wks., San Francisco.	
Vulcan Iron Works, Wilkesbarre.	84
Vulcan Iron Works Co., Toledo	78
Walters & Co.	59
Wallace, H. V.	57
Waller & Renaud	57
Washburn Co., The	
Washington Iron Wks. Co.	
Watson, R. B.	57
Watt Mining Car Wheel Co.	27
Watters, D. M.	57
Weber & Co., F.	76
Weber Gas & Gaso. Eng. Co.	27
Webster Mfg. Co.	69
Weil, I.	
Weinberg, E. A.	57
Weir Bros. & Co.	59
Weisel & Kock	57
Welch, Max J.	57
Wellman-Seaver-Morgan Eng.	5
Wenstrom, O.	57
Werner, George E.	57
Western Chemical Mfg. Co.	81
Western Forge Co.	68
Westinghouse Elec. & Mfg Co.	21
Weston Elec. Instrument Co.	
Wetherill Separating Co	79
Wheeler, H. A.	57
Whitcomb Co., G. D.	
White E. F.	57
White & Co., J. G.	57
Whitney & Co., J. L.	68
Wiener Co., E.	33
Wile Power Gas Co.	
Wiley, W. H.	57
Wilfley Ore Concentrator Synd.	
Willamette Iron and Steel Wks.	
Williams, P	57
Williams Pulverizer Co.	84
Willmott, A. B.	57
Wilson, H.	57
Witte Iron Works Co.	
Wolverine Copper Mining Co.	58
Wonham-Magor Eng. Works.	33
Woodbury, George E.	
Wood Drill Works	
Wood, George R.	57
Wood & Co., Henry E.	57
Wood & Co., R. D.	74
Worcester, S. A.	57
Word, W. F.	57
Worthington, H. R.	25
Wright, L. A.	57
Wyckoff & Son Co., A	80
Wyckoff-Wood Pipe Co	80
Wyer, S. S.	57
Yale & Towne Mfg. Co.	48
Yeatman, P.	57
York Bridge Co.	63
Young, Robert	57
Yunge, Guillermo	57

LEYNER DRILLS

Georgetown, Colo., April 5th, 1906.
The J. Geo. Leyner Engineering Works Co.,
Denver, Colo.

Gentlemen:

I have used, or witnessed the use of, all of the prominent American makes of machine drills for the past twenty-five years, and for the last two years I have used only the 3" Water Leyner Drills in driving as hard a cross cut tunnel as this state can show, and these drills have given me perfect satisfaction in every respect, showing economy in use of air, uniform lubrication with your automatic oiler, and leaving the atmosphere of the tunnel free from obnoxious dust at all times.

I would not change these drills for any others, and heartily recommend their use to all who are in need of such machines for all mining purposes.

Respectfully,
WM. COOPER, Supt. and Manager,
Capital Mining and Tunnel Co.

The Water Leyner is unquestionably the fastest drilling and most economical rock drill made today.

We manufacture Complete Drilling and Hoisting Plants.

CATALOGS ON REQUEST.

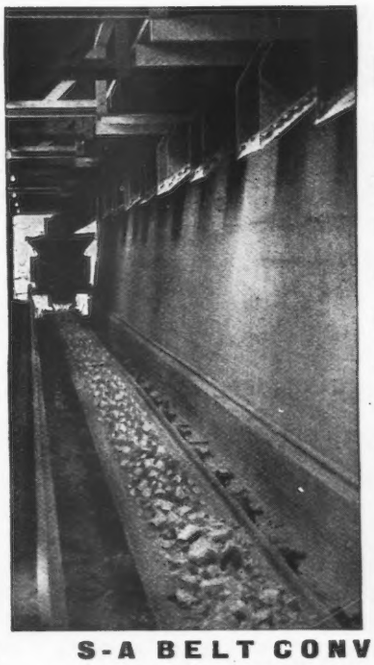
The J. Geo. Leyner Engineering Works Co.
LITTLETON, COLO., U. S. A.

Laclede xxx Fire Bricks Are Especially Made to Withstand Abrasion

such as occurs in the upper part of blast furnaces, lime kilns, e c. These bricks are made from a special mixture of calcined and raw Cheltenham Clay with Flint Clay and are formed by our stiff mud process and repressed. The result is a very refractory brick which also possesses the qualities of withstanding the mechanical wearing due to the descending change. All Laclede Fire Bricks are made on this principle—a special brick for each special need—and thus you always get full satisfaction.

Write for special Brick Catalog No. 5.

Laclede Fire Brick M'f'g Co.,
St. Louis, Mo., U.S.A.



FOR

HANDLING

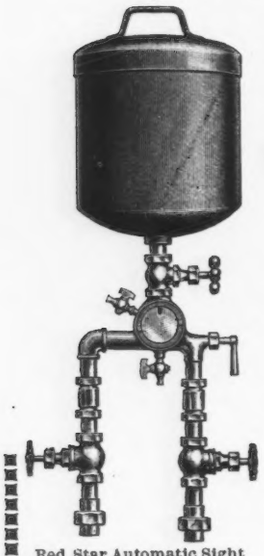
ORES
STONE
COAL
GRAVEL
CLAY
CEMENT
TAILINGS
SAND
and all
BULK MATERIALS

S-A BELT CONVEYORS SOLVE THE PROBLEM and PRODUCE RESULTS.

We publish a monthly bulletin called *Conveying and Transmission*, which contains interesting information on these subjects, and will be sent free on application.

STEPHENS-ADAMSON MFG. CO.
Main Office and Works, AURORA, ILL.
Chicago Office, First National Bank Bldg.
Canadian Selling Agents: W. H. C. Mussen & Co., Montreal, Quebec.

DECREASE YOUR FUEL BILLS.



Red Star Automatic Sight Feed Boiler Compound Feeder and Mixer.

Decrease them through the use of

"Red Star" Boiler Compound

It not only removes all scale that is in the boiler, but it also prevents more from forming.

Let us prove to you that "Red Star" will do this.

Send for our 12, 16 and 96 page booklets.

LAKE ERIE BOILER COMPOUND CO.

192-198 CHICAGO ST., BUFFALO, N. Y.

DENVER & RIO GRANDE R.R. — SCENIC LINE OF THE WORLD

TO THE MINING MEN AND INVESTORS

The Denver & Rio Grande Railroad

"SCENIC LINE OF THE WORLD"

Offers the same convenient train service, comfortable and luxurious accommodations and the same impressive scenic grandeur at all seasons of the year.

The System with its numerous branches reaches all the important mining, milling, cyaniding, chlorinating and smelting centers in Colorado and Utah; also the world's greatest mining camps—TONOPAH, GOLDFIELD and BULLFROG—are easily reached by close connection and a perfect system of through-car service.

All through trains are equipped with modern Pullman and Tourist Sleeping cars, day coaches, and a superb dining car service operated on the á la carte plan. Through Pullman and Tourist sleepers between Chicago, St. Louis, Denver and San Francisco without change.

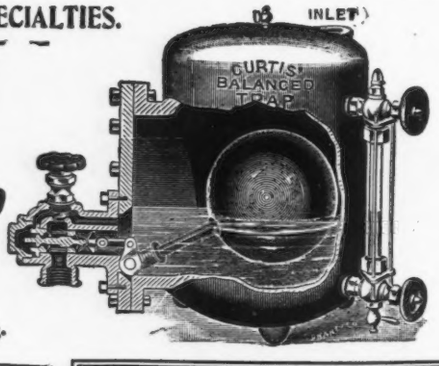
For rates, folders, illustrated booklets and other information, address

S. K. HOOPER, G. P. & T. A., Denver, Colo.

CURTIS ENGINEERING SPECIALTIES.

Balanced Steam Trap

A perfectly balanced Valve. Will work on any pressure from 1 to 250 lbs.



SEND FOR CATALOGUE.

Julian d'Este Co.

24 Havmarket Sq., Boston. Mass.

ALBANY GREASE

LUBRICATES EVERYTHING

Trade Mark

Reg. U. S. Pat. of

on every package

Special Offer

A sample can of grease and one ALBANY GREASE CUP free of charge or expense for testing. Always give name of concern. The only information necessary to send is pipe connection in bearing, depth of oil hole from top of cap to journal, and give particular part of machinery on which the same is to be tested.

Made only by **Adam Cook's Sons**
313 West Street, N. Y. City, U. S. A.

MERCHANDISE CHECKS

AMERICAN RAILWAY SUPPLY CO.

Address Dept. H 4 Park Place, New York

Gilbert Wood Split Pulleys

Represent the product of 20 years experience, and detail improvement

Write for Catalogue.

Manufactured by

Saginaw Mfg. Co.,

Saginaw, Mich. U. S. A.

New York Branch, 44 Dey Street.
Chicago Branch, 32 S. Canal Street.
Sales Agencies in all the Principal Cities.

USE **BISHOP PLATINUM APPARATUS**

All forms for Chemists, Assayers and Metallurgists.

J. BISHOP & CO.

MALVERN, PA.

Platinum Scrap Purchased.

Established 1842.

The South Dakota School of Mines

located in the Black Hills, offers unusual facilities for students in Mining, Metallurgy, Chemistry, Mineralogy, Geology, Surveying, etc. For Catalogue, address

CHARLES H. FULTON, President,
Rapid City, S. D.

Accident Savers – Money Savers

"TRIPLEX" CHAIN BLOCKS

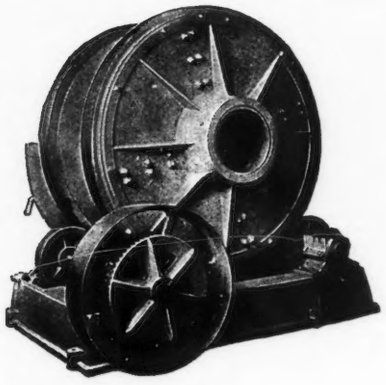
on tripods used in your mine for handling pumps, engine parts, etc., will prevent accident. They save time and money, too. Won't cost you a cent for a 30-day trial. Write.

YALE & TOWNE MFG. CO.

9 MURRAY ST., NEW YORK.

THE F.M. DAVIS IRON WORKS CO DENVER COLO

ECONOMY
EFFICIENCY & DURABILITY
IN
MINING & MILLING MACHINERY



The Ferraris Ball Mill.

A wet crushing ball mill unequalled in capacity — granular product—small power—low cost of repairs.

Saves

Five cents per ton on the cost of repairs, makes big saving in floor space, dispenses with elevators and screens, causes only minimum of slimes, wearing parts easily—quickly—renewed.

Price $1400

Fully described in Catalog No. 43.

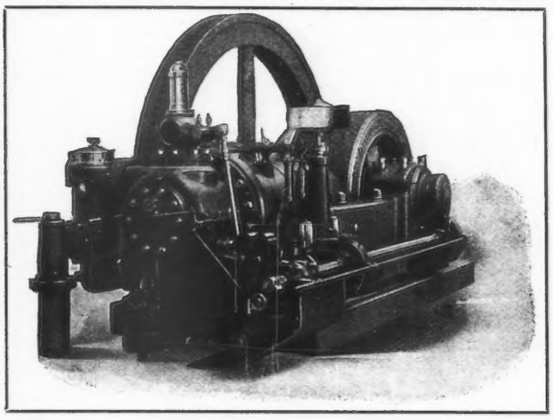
THE F.M. DAVIS IRON WORKS CO DENVER COLO

ECONOMY
EFFICIENCY & DURABILITY
IN
MINING & MILLING MACHINERY

KOERTING GAS PRODUCERS AND ENGINES.

50 to 3000 H. P.

OVER 250,000 H. P. IN OPERATION



Note the STRONG AND SOLID construction of the engine shown above.

Koerting engines run at low speed and are built for HEAVY AND CONTINUOUS DUTY. Each detail most carefully considered and worked out by expert gas engineers.

Our Catalog C Describes Them.

DE LA VERGNE MACHINE CO.

New York Atlanta
Boston Philadelphia St. Louis
Chicago Cincinnati Pittsburg

For "Quarter Turns"

for high speeds over small pulleys, for 33% more pulling power, longer life and greater satisfaction in every respect, use

SABLE Rawhide Belting

"Sable" does not have to be especially ordered or especially prepared for any belting service—it is ready.

Ready with the cling-to-pulley quality of its kid-like exterior, produced by surface tanning.

Ready with the long, strong rawhide fibres underneath, unbroken and unseparated by tanning. Ready to prove every claim we make for it by a 60 days' trial at our expense.

Ready to increase your power and decrease your belting bills. Get booklet No. 1 for details.

SHULTZ BELTING COMPANY, ST. LOUIS, MO.

New York, 111 Chambers St. Boston, 114 High St. Philadelphia, 116 North Third St.

DIRECTORY OF ENGINEERS, METALLURGISTS, CHEMISTS, ETC.

To those in need of Professional Advice and Service we commend the names in this Directory. This is a list of the active, vital men of the mining and metallurgical professions. There is nowhere on earth so representative a list of a profession's leading members.

UNITED STATES.

ALABAMA.

Phillips & Co., W. B.

ARIZONA.

Blauvelt, H.
Claypool, W. M.
Defty, W. E.
Heller & Wright.
Hughes, Thos.
King, Jacob.
Rockwell, A. M.
Smith, F. W.
Williams, P.

ARKANSAS.

Purdue, A. H.

CALIFORNIA.

Abadie, E. R.
Additon, A. S.
Bandmann, C. J.
Bosqui, F. L.
Bradley, Fred W.
Brown, R. G.
Burch, A.
Comstock, Theo. B.
DeKalb, Courtenay.
Draper, T. Waln-Morgan.
Dwight Engineering Co.
Esselstyn, J. N.
Falkenau Assaying Co.
Haas, H.
Hanks, Abbot A.
Harvey, F. H.
Hoffman, R. B.
Hoover, T. J.
Holmes, G. L.
Huntley, D. B.
Janin, Charles.
Janin, Stebbins & Smith.
Jenks, A. W.
Juessen, E.
King, L. M.
Littlefield, J. F.
Mathis, T. S.
McLennan, J. F.
Mudd, S. W.
Miners' Assay Office.
Neill, J. W.
Nourse, C. F.
Noyes, William S.
Perry, O. B.
Probert, F. H.
Ralston, J. C.
Richards, R. DeC.
Roote, G. J.
Shipman, H. A.
Smith, Emery & Co.
Smith, Howard D.
Thompson & Gilliam.
Trent, L. C.
Welch, M. J.
Werner, G. E.

COLORADO.

Arthur, E. P., Jr.
Brandes, J. F.
Burlingame, E. E. & Co.
Burton, H. E.
Carpenter, F. R.
Chase, E. E.
Collins, Geo. E.
Denver Laboratories, The
Denver Ore Testing & Sampling Co.
Dikeman, J. M.
Doveton & Purington.
Eberenz, Geo. B.
Fairchild, O. H.
Farish, John B.
Finch, J. W.
Frenzel, A. B.
Grant, R. J.
Hewitt-Carstarphen Co.
Hewett, G. C.
Hills & Willis.
Holland, L. F. S.
Hunt, E. W.
Kyle & Co., T. D.
Leonard & Root.
Minard, F. H.
Nicholson, H. H.
Pritchett, C. W.
Revett, B. S.
Schroter, G. A.
Schwarz, Theo. E.
Sebben, E. W.
Snedaker, J. A.
Titus, N. C.
Toll, R. H.
Wiley, W. H.
Wood, Henry E.
Worcester, S. A.

CONNECTICUT.

Adams, H.
Nason, F. L.

FLORIDA.

Grothe, O.

GEORGIA.

Mansfield, H. M.

IDAHO.

Antisell & Corr.
Easton, S. A.
Mandell, F. C.
Spalding, E. P.

ILLINOIS.

Allen, H. A.
Dickman & MacKenzie.
Harris, F. S.
Herr, H. B
Hollis, H. L.
Hunt, R. W. & Co.
Long, F. H.
Loring, Frank C.
Rogers, A. P.
Stevens, A. W.

MARYLAND.

Brackett, F. E.
Rutledge, J. J.

MASSACHUSETTS.

Crosby, W. O.
Fisk, W. W.
Hutchinson, W. S.
Packard, Geo. A.
Peters, E. D.
Richards, R. H.
Wenstrom, O.

MINNESOTA.

Carlson Exploration Co.
Elftman & Cull.

MISSOURI.

Church, L. C.
Nicholson, Frank.
Kirby, E. B.
Welch, M. J.
Wheeler, H. A.

MONTANA.

Atwater, R. M., Jr.
Bard, D. C.
Barker & Wilson.
Bergstrom, O.
Brown, W. G.
Heywood, W. A.
Leggat, A.
Rombauer, A. B.
Sanders, W. E.
Sizer, F. L.
Stephens, A. H.
Word, W. F.

NEVADA.

Arnett & Co., W. D.
Gilkerson, H. G. & E. W.
McClelland, J. G.
Miller, I.
Stevens, W. A.
Turner & Gates.

NEW MEXICO.

Bible & Sully.
Brown, C. T.
Edwards, H. W.
Franke, E. A.
Riebling, H. F. A.

NEW YORK CITY.

Adams, W. H.
Bailey, J. Trowbridge.
Beatty, A. Chester.
Blow, A. A.
Burger, C. C.
Cements, J. Morgan.
Channing, J. P.
Church, John A.
Constant, C. L.
Dufourcq, E. L.
Fearn, Percy L.
Hammond, J. H.
Hill, Robt. T.
Holden, E. C.
Hutchins, J. P.
Kempton, C. W.
Klepetko, Frank.
Knox & Allen.
Lawrence, B. B.
Lefevre, H. F.
Lidner, P. G.
Marsters, V. F.
Maynard, Geo. W.
McCaustland, E. J.
Merrill, F. J. H.
Messiter, E. H.
Morrow, J. T.
Olcott, Corning & Peele.
Randolph, J. C. F.
Raymond, R. W.
Riordan, D. M.
Robbins, P. A.
Rogers, A. H.
Rogers, E. M.
Sharpless, Fred F.
Simonds & Wainwright
Spilsbury, E. G.
Stonestreet, G. D.
Sussmann, O.
Thayer, B. B.
Tonking, J. B.
Townsend, A. R.
Von Leer, I. W.
Waller & Renaud.
Watson, R. B.
White, C. F.
Yeatman, Pope.

NORTH CAROLINA.

Gilchrist, P. S.
Megraw, H. A.

OHIO.

Emmerton, F. A.
Wellman-Seaver-Morgan Co
Wyer, S. S.

OREGON.

Adams, W. H.
Boggs, G. W.
Elmer, William Wells.
Evans, C. W.
Greenley, L. A.
McEwen, Arthur & McEwen.
Peacock, Samuel.
Watters, D M.

PENNSYLVANIA.

Ayres, W. S.
Brockman & Co., E. T.
Demming, H. C.
Emmens, N. W.
Kennedy, Julian.
Metallurgical Laboratory.
Queneau, A. L.
Spackman Eng. Co., H.
Tuttle, E. G.
Wood, Geo. R.

TENNESSEE.

Crawford, W. H...

TEXAS.

Akers, W. A.
Canby, R. C.
Critchett & Ferguson.
DeVore, E. H.
Malcolmson, J. W.
Parker & Parker.

UTAH.

Cates, L. S.
Daggett, E.
Gunn, Geo. E.
Jennings, E. P.
Jones, C. C.
Molson, C. A.
Officer & Co., R. H.
Overstrom, G. A.
Parrish S. F.
Robinson, G. H.
Rohlfing, R. P.
Tanner, W. N.
Union Assay Office.

WASHINGTON.

Clarke, Roy H.
Hill, F. A.
Jamme, G., Jr.
Kelly & Chapman.
Lammers, T. L.
Landes, H.
MacDonald, B.
Miller, W. C.
Rice, L. M.
Swann & McCain Co.
Thyng, W. S.
Young, Robert.

WEST VIRGINIA.

Stow, A. H.

WISCONSIN.

Hodge, Benj. H.
Trego, F. H.

WYOMING.

Beeler, H. C.
Wilson, H.

FOREIGN.

ALASKA.

Buck, Rufus.

BRITISH COLUMBIA.

Bonthrone, B.
Brewer, W. M.
Haggen, E. A.
Musgrave, E. C.
Rebbeck, J. K.

CANADA.

Ayres, W. S.
Aldridge, W. H.
Atkinson, I. B.
Beardsley, G. F.
Evans, J. W.
Ferrier, W. F.
Forbes, D. G.
Fowler, S. S.
Hamer, A. T. E.
Tyrrell, J. B.
Willmott, A. B.

MEXICO.

Anderson, R. H.
Babb, P. A.
Bagg, R. M.
Bradley D. H., Jr.
Braschi, V. M.
Brodie, Walter M.
Carpenter & Brennon.
Carpenter & Co., Chas. W.
Conner, J. N. A.
Dwight, A. S.
French, G.
Gardner & Shearer.
Gordon & Chippendale.
Helm, J. D.
Hobson & Co., F. J.
Holms, W. L.
Kedzie, G. E.
Laird, G. A.
Lawrence, T. J.
Lineberger & Rone.
Lloyd, R. L.
McCord, W. H.
Morgan, Donald R.
Nahl, A. C.
Norton, N. B.
Peterson, B.
Pomeroy, W. A.
Schiertz, F. A.
Scobey, J. C.
Stadelmann, G.
Seamon, W. H.
Sustersic, Ferdinand.
Swoyer & Van Dreveldt.
Tays, E. A. H.
Timmons, Colin.
Tomlinson, B. J.
Treadwell, John C.
Wallace, H. V.
Weisel & Kock.
Wright, L. A.

AUSTRALIA.

Borrowe, G. W.
Diggles, J. A.
Herzig, C. S.
Knox, Schlapp & Co.
Loring, W. J.
Millen, J. D.
Mitchell, D. P.

NEW ZEALAND.

Holland, C. H.

EUROPE.

ENGLAND.

Charleton, Dickinson & Co.
Leggett, T. H.
Nichols, R.
Pearse, Kingston & Brown.
Pellew-Harvey & Fell.
Pettit, A. E.
Prichard, W. A.
Scott, H. K.
Weinberg, E. A.

RUSSIA.

Allen, W. W.

JAPAN.

Knox, N. B.

CENTRAL AMERICA.

COSTA RICA.

Smith, A. M.
Shaw, R. C.

NICARAGUA.

Stanford, R. B.

SOUTH AMERICA.

BRAZIL.

Lisboa, M. Anajado R.

COLOMBIA.

Hutchins, J. P.

ARGENTINE.

Boggs, Wm. R., Jr.

CHILE.

Yunge, Guillermo.

PERU.

Lukis, Ernest Du B.
Marsters, V. F.
Reed, D. C.

SOUTH AFRICA.

Denny, G. A.
Garthwaite, E. H.
Hollow, Jas. T.

ABADIE, EMILE RECTOR,
CONSULTING MINING ENGINEER,
1004-1006 James Flood Bldg., San Francisco, Cal.
Cable Address: "Erabad," San Francisco.

ADDITON, A. SYDNEY,
CYANIDE CHEMIST AND CONSULTING ENGINEER.
Plants Designed and Installed. Examinations made.
301 Market St., San Francisco.

ALLEN, HENRY A., M. A. S. M. E., M. V. D. I.,
CONSULTING MECHANICAL ELECTRICAL AND HYDRAULIC ENGINEER.
Designing, Estimating, Valuating, Testing and Inspecting Power, Water Works, Hoisting, Compressed Air, Pumping, Gas and Irrigation Plants and Machinery.
Steam Turbine and Gas Producing Plants a Specialty.
1435 First National Bank Building,
Chicago, Illinois.

ADAMS, HENRY,
MINING ENGINEER,
12 years in Spanish America,
33 Fremont St., New London, Conn.

AKERS, WM. A.,
MINING ENGINEER,
505 Union Trust Building,
Los Angeles, California.

ADAMS, WILLIAM H.,
MINING ENGINEER AND METALLURGIST,
Specialty: Pyrites, Copper Ores, Gas Producers to Utilize Low Grade Fuels, Wood, Coal, Lignites, Culm, etc.
New York Office: Suite 808, 18 Broadway.
P. O. Box 719, Seattle, Wash.

ALLEN, W. W.,
CONSULTING ENGINEER,
Specialties: Designing, Constructing and Organizing Mining, Metallurgical and Industrial Plants,
care Caucasus Copper Company, Ltd.,
Batum, Russian Caucasia, Russia.

ALDRIDGE, WALTER H.,
MINING AND METALLURGICAL ENGINEER,
Care Canadian Pacific Railway,
Trail, B. C., and Banff, Alberta.

ANDERSON, ROBERT HAY,
CONSULTING MINING ENGINEER,
La Independencia 9, Apartado 866,
Mexico, D. F.

Toner Antisell. William Corr.
ANTISELL & CORR,
MINING AND METALLURGICAL ENGINEERS,
Surveys—Plans—Reports.
811 Idaho Street, Boise, Idaho.

ARMSTRONG, L. K.,
MINING ENGINEER,
Box 14, Spokane, Wash.
Examinations and Estimates.

ARNETT & CO., W. D.,
MINING ENGINEERS,
Examinations and Reports Assaying and Metallurgical Laboratory. Ore Testing Works.
Reno, Nevada.

ARTHUR, EDWARD P., JR.,
MINING ENGINEER,
Care Bimetallic Bank, Cripple Creek, Colo.

ATKINSON. I. B.,
CONSULTING MINING ENGINEER.
Codes: Bedford McNeill, Moreing & Neal. P. O. Box 540.
Rooms 4 and 5 McGregor Block, Victoria, B.C.

ATWATER, RICHARD M., JR.,
MINING ENGINEER,
Helena, Mont.
M. W. Atwater.

AYRES, W. S.,
MINING AND MECHANICAL ENGINEER,
Hazelton, Pa. and Banff, Alberta, Canada.
Consultation, Examination, Reports Thirteen years' experience as Manager of Iron and Coal Mines.

BABB, PERCY ANDRUS,
CONSULTING ENGINEER,
General Office and Field Work Undertaken, Reports, Investigations, Managements, Estimates, Etc.
Gante No. 8, Mexico, D F

BAGG, RUFUS M., JR, PH.D.,
CONSULTING MINING ENGINEER,
Apartado, 197. Chihuahua, Mexico.

BANDMANN, CHAS. J.,
ENGINEER OF MINES,
Prescott, Arizona. All Codes. 2905 Bush Street, San Francisco, Cal.

BARD, DARSIE C.,
MINING ENGINEER,
130 Pennsylvania Bldg.,
Ely, Nev. Butte, Mont.

BARKER & WILSON,
MINING ENGINEERS,
Deputy United States Mineral Surveyors,
Butte, Mont.

BEARDSLEY, G. F.,
METALLURGIST,
Specialty: Pyritic Smelting,
Pine Lodge, West Somers, Westchester Co., N.Y.

BEATTY, A. CHESTER,
MINING ENGINEER,
71 Broadway New York, N. Y.
Cable: "Granite." Code: Bedford McNeill.

BEELER, HENRY C.,
MINING ENGINEER,
Cheyenne, Wyo.
State Geologist of Wyoming.

BERGSTROM, O.,
COPPER METALLURGIST,
Specialty:
Knudsen Pyritic Converter Smelting.
Butte, Montana.

J. W. BIBLE, A. I. M. E. J. M. SULLY, S. B.
BIBLE & SULLY,
Consulting Mining and Mechanical Engineers.
Bedford McNeill Code.
Hanover, Grant County, New Mexico.

BLAUVELT, HARRINGTON,
MINING ENGINEER AND METALLURGIST,
Prescott, Arizona.
Examinations, Reports and Surveys.

BLOW, A. A.,
CONSULTING MINING ENGINEER,
Mills Building, New York.

BOGGS, WM. R., JR.,
CHEMIST AND METALLURGIST,
Ocampo E. de Michoacan, Mexico.

BONTHRONE, BARCLAY,
CONSULTING MINING ENGINEER,
614 Hastings Street, Vancouver, B. C.
Cable Address: "Bonthrone," Vancouver.

BORROWE, GEORGE W.,
MINING ENGINEER,
Manager, Sons of Gwalia, Ltd.
Leonora, Western Australia.

BOSQUI, FRANCIS L.,
METALLURGICAL ENGINEER,
Temporary Address: Ross, California.
Cable "Franbo." San Francisco. Code: Bedford-McNeill.

BRACKETT, F. ERNEST,
MINING ENGINEER,
Coal Mining a Specialty.
Walsh Building, Cumberland, Maryland.

BRADLEY, D. H., JR,
MECHANICAL ENGINEER,
Reports on Equipments of Mining Properties.
Plans and Constructs Plants: Electric, Gas or Steam.
P O Box 155. Parral, Chihuahua, Mexico.

BRADLEY, FRED. W.,
MINING ENGINEER,
2661 Broadway, San Francisco.
Cable Address: "Basalt," San Francisco.
Code: Bedford-McNeill.

BRANDES, JUAN FELIX,
MINING ENGINEER.
509 Equitable Building, Denver, Colo,
2 Keith St, Berlin, W. Germany.
Codes: Bedford-McNeill and Western Union.

BRASCHI, VICTOR M., E.M.C.E.,
ENGINEER AND CONTRACTOR,
P. O. Box No. 830. Cadena St., No. 2.
City of Mexico, Mexico.

BREWER, WILLIAM M.,
CONSULTING MINING ENGINEER,
24 Rae St. (P. O. Box 571), Victoria, B. C.

BROCKMAN & CO., E. T.,
MINING ENGINEERING,
Make practical Examinations, Reports and Estimates,
Keystone Building, Pittsburgh, Pa.

BRODIE, WALTER M.,
MINING ENGINEER AND METALLURGIST,
P. O. Box 219. Chihuahua, Mexico.

BROWN, CONY T.,
MINING ENGINEER,
Secretary and Treasurer New Mexico School of Mines.
Socorro, New Mexico.

BROWN, ROBERT GILMAN,
CONSULTING ENGINEER,
2031 Sutter Street, San Francisco, Cal.
Cable, "Argeby," San Francisco. Code: Bedford-McNeill.

BROWN, WILTON G.,
Specialist in Ore Treatment; Assayer.
Tests, Investigation and Reports.
Helena, Montana.

BUCK, RUFUS,
MINING AND CIVIL ENGINEER,
Dawson, Y. T.

BURCH, ALBERT,
MINING ENGINEER,
Temporarily:
Cosmos Club, San Francisco, California.

BURGER, C. C.,
CONSULTING MINING ENGINEER,
Room 1206, 71 Broadway, New York City.
Examination and Superintendence of Mining Properties.

CANBY, R. C.,
CONSULTING METALLURGIST,
Low Grade Copper and Lead Ores with Excessive Zinc.
El Paso, Texas.

Gust Carlson, Pres. & Treas.,
H. F. Kendall, E. M., Vice-Pres.,
G. A. Wellner, Sec'y.
CARLSON EXPLORATION CO.,
(Incorporated)
EXPLORING AND MINING ENGINEERS,
Operating Churn and Diamond Drills.
Hibbing, Minnesota.

Alvin B. Carpenter, E. M. J. C. Brennon, E. M.
CARPENTER & BRENNON,
MINING ENGINEERS,
Mutual Building,
Mexico City, Mexico.

CARPENTER. F. R., Ph. D., F.G.S.A.
Arthur-Howe Carpenter, Met. Eng.
MINING AND METALLURGICAL ENGINEER,
Equitable Building, Denver, Colorado.
Cable Address: "Carpenter."

CATES, LOUIS S.,
MINING ENGINEER,
Manager, Boston Consolidated Mining Company,
Bingham Canyon, Utah.

CHANNING, J. PARKE,
CONSULTING ENGINEER,
11 Broadway, New York.

CHARLETON, DICKINSON & CO.,
MINING ENGINEERS AND MINE MANAGERS,
352 Mansion House Chambers, London.
Cable Address: "Ingressio."
Codes: Bedford-McNeill and Moreing & McCutcheon.
Representative in Singapore C. G. Warnford Lock.

CHASE, EDWIN E.,
MINING ENGINEER,
932 Equitable Bldg., Denver, Colo.

CHURCH, JOHN A.,
MINING ENGINEER,
15 William St., New York.
Cable: "Scotist."

CHURCH, L. C.,
CONSULTING AND MINING ENGINEER,
Lead and Zinc a Specialty.
Joplin, Missouri.

CLARKE, ROY H.,
MINING ENGINEER,
314-315 Lindelle Block, Spokane, Wash.

CLAYPOOL, W. M., C. E., M. E.,
Examinations and Reports
for Investors only.
Prescott, Arizona.

CLEMENTS, J. MORGAN,
ECONOMIC GEOLOGIST AND MINING ENGINEER,
Bedford-McNeil Code.
Box 1267, Bisbee, Ariz. 15 William St., N. Y.

COLLINS, GEORGE E,
MINING ENGINEER,
Mine Examinations and Managemen',
420 Boston Building, Denver, Colorado.
Cable Address: "Colcamac," Denver.

COMSTOCK, THEO. B.,
MINING ENGINEER AND METALLURGIST,
Reports, Management, Consultation.
Act only in Interest of Investors.
Clients among largest American and European Companies.
534 Stimson Bldg., Los Angeles, Cal.
Cable Address: "Tibico."
Codes: Bedford McNeill, Lieber, Moreing & Neal.

CONNOR, J. N. A.,
MINING AND METALLURGICAL ENGINEER,
Specialty: Metallurgy Lead, Copper,
and Cyanidation of Silver Ores.
Examinations, Designs, Management and Tests
Metallurgical Engineer to the Veta Colorado
Mining and Smelting Company.
Box 145, Parral, Mexico.

CONSTANT, C. L., E. M.,
CONSULTING MINING ENGINEER,
61 Beekman Street, New York.

CRAWFORD, W. H., M. A. I. M. E.,
MINING ENGINEER,
716-717 First Nat'l Bank Bldg. (Skyscraper), Nashville, Tenn.
Vice-Pres. and Gen. Mgr. Southern Mining, Milling and
Development Company, Silver Plume, Colorado.

CROSBY, W. O.,
CONSULTING GEOLOGIST & MINING ENGINEER.
Examinations and Reports.
Massachusetts Institute of Technology.
Boston, Mass.

DAGGETT, ELLSWORTH,
MINING ENGINEER,
Salt Lake City, Utah.

DEFTY, W. E.,
MINING ENGINEER,
Consulting, Examinations, Reports.
Thorough Knowledge of Arizona and the West.
Phoenix, Arizona.
Cable Address: "Wed" Codes: Lieber McNeill.

DE KALB, COURTENAY,
MINING ENGINEER AND METALLURGIST
406 Wilcox Building,
Los Angeles, California

DEMMING, HENRY C.,
MINING ENGINEER,
Geologist, Mineralogist and Chemist.
Offices and Laboratory, 15-17 North Third St.
Harrisburg, Penn., U. S. A.

DENNY, G. A.,
MINING AND CONSULTING ENGINEER,
603-4 Consolidated Building,
Fox Street,
or P. O. Box 4181, Johannesburg, South Africa.

DEVORE, E. H.,
MINING ENGINEER AND GEOLOGIST,
P. O. Box 249, Office, No. 6, Little Plaza,
El Paso, Texas.

DICKMAN & MACKENZIE,
MINING ENGINEERS, ASSAYERS AND CHEMISTS.
1120 Rookery Bldg., Chicago.
Cable Address: "Dickmack" Chicago.

DIGGLES, J. A.,
MINING ENGINEER,
With Bewick Moreing & Co.,
Lawlers, West Australia.

DIKEMAN, J. M.,
MINING ENGINEER,
P. O. Box 145, Delta,
Colorado.

DOVETON & PURINGTON,
MINING AND METALLURGICAL ENGINEERS,
Mining and Geological Examinations, Ore Testing,
Process Devising, and Design of Ore Treatment Plants.
Cable "Doveton." McPhee Bldg., Denver, Colo.

DRAPER, T. WALN-MORGAN,
CONSULTING MINING ENGINEER,
Pacific Coast properties of non-resident owners managed.
3034 Jackson St., San Francisco, Cal.

DUFOURCQ, EDW. L.,
MINING ENGINEER,
L. 4 and 5 Produce Exchange Bldg.
McNeill Code. New York.

DWIGHT, ARTHUR S.,
MINING ENGINEER AND METALLURGIST,
General Manager Greene Consolidated Copper Company,
Cananea, Sonora, Mexico

F. L. Dwight, President.
DWIGHT ENGINEERING CO.,
CONSULTING, MINING & METALLURGICAL ENGINEERS,
Examinations and Reports. Mills Designed and Erected.
345 Wilcox Building, Los Angeles, Cal.

EASTON, STANLY A.,
MINING ENGINEER.
Manager, Bunker Hill & Sullivan Mining &
Concentrating Company,
Kellogg, Idaho.

EDWARDS, HENRY W.,
METALLURGICAL ENGINEER AND CONTRACTOR,
Furnace and General Metallurgical Construction.
At present Remodelling the Silver City Reduction Works.
Silver City, New Mexico.

A. H. Elftman. J. B. Cull.
ELFTMAN & CULL,
706 Globe Bldg., Minneapolis, Minn.
Advisory Reports on Mining Investments.
Examination and Management of Mines.

ELMER, WILLIAM WELLS,
CONSULTING MINING ENGINEER,
Wilson Bldg., Sumpter, Oregon.
Cable Address: Elmer, Sumpter.
Codes: Bedford McNeill and Western Union.

EMMENS, NEWTON W.,
MINING ENGINEER.
Examinations and Reports made upon Mining Properties.
Consulting Engineer to Elwood Tinworkers' Gold Mining Co.,
Park Building, Pittsburg, Pa.
Cable Address: "Sanspeur Pittsburg." Codes: Liebers.

EMMERTON, F. A.,
METALLURGIST, CHEMIST AND ASSAYER,
Mining Properties Examined and Reported on.
9 Bratenahl Bldg., Cleveland, Ohio.

ESSELSTYN, J. N.,
MINING ENGINEER,
St. Francis Hotel, San Francisco, Cal.
Bedford-McNeill Code.

EVANS, C. W.,
MINING ENGINEER AND GEOLOGIST,
Ashland, Oregon, U. S. A.

EVANS, J. W.,
CONSULTING MINING ENGINEER,
Cobalt, Ontario.

FAIRCHILD, O. H.,
CONSULTING, MINING & METALLURGICAL ENGINEER.
Examinations and Reports. Mills Designed and Erected.
219 West First Avenue, Denver, Colo.

FARISH, JOHN B.,
MINING ENGINEER,
517-520 Cooper Bldg., Denver, Colo.
Cable Address: "Farish," Denver.

FEARN, PERCY L.,
MINING ENGINEER,
36 Wall Street, New York.

FERRIER, W. F., B.A.SC.F.G.S.,
CONSULTING MINING
ENGINEER AND GEOLOGIST,
Late Petrographer to Geological Survey, Canada.
Rossland, B. C.

FINCH, JOHN WELLINGTON,
MINING ENGINEER AND GEOLOGIST,
46 Jacobson Building, Denver, Colorado.
Code: Bedford-McNeill.

FISK, WINTHROP W., B. S.,
CONSULTING MINING ENGINEER,
22 Congress St., Boston, Mass.
Austin, Nevada.
Cable, "Minero." Codes: Western Union, McNeill.

FORBES, DONALD G.,
MINING ENGINEER AND METALLURGIST,
Examinations and Management of Mines on the Pacific Coast.
Board of Trade Buildings, Victoria, B C.

FOWLER, SAMUEL S.,
MINING ENGINEER AND METALLURGIST,
Nelson, British Columbia.

FRANKE, EMIL A., E. M.,
MINING, MILLING AND METALLURGY,
Superintendent of American Metals Co.
Bedford-McNeill Code. Las Cruces, N. M.

FRENCH, GERMAN,
MINING ENGINEER AND MINE MANAGER,
Apartado 156, Durango, Mexico.

FRENZEL, A. B.,
RARE MINERALS,
Examination of Rare Mineral Deposits.
Equitable Building, Denver, Colorado.

GARDNER AND SHEARER,
CONTRACTING MECHANICAL AND
ELECTRICAL ENGINEERS,
Avenida Juarez 6, Mexico, D. F.

GARTHWAITE, E. H.,
CONSULTING MINING ENGINEER,
British South Africa Company,
Bulawayo, Rhodesia, S. A.

GILCHRIST, PETER S.,
CHEMICAL ENGINEER,
Sulphuric Acid and Fertilizer Plants, Specialties,
Charlotte, N. C.

GILKERSON, H. G. & E. W.,
MINING ENGINEERS; U.S. DEPUTY MINERAL SURVEYORS,
Mining Propositions Examined for Investors only.
H. G. Gilkerson, B. S., C. E., Mem. A.I.M.E., P.O. Box 843. Goldfield, Nev. E. W. Gilkerson, Telluride, Colo.

GORDON & CHIPPENDALE,
MINING AND CIVIL ENGINEERS,
International Banking Corporation,
Calle Tiburcio 18, Mexico City.

GRANT, R. J.,
MINING ENGINEER,
415 Mining Exchange Building, Denver, Colorado.
Cable Address, "Rogrant." Code: Bedford-McNeill.

GREENLEY, LOUIS A.,
MINING AND METALLURGICAL ENGINEER,
Consulting Engineer for Commercial Mines Co.,
Rye Valley, Oregon,
204½ Washington St., Portland, Oregon.

GROTHE, O., PH. D.,
CHEMIST, MINERALOGIST, ENGINEER,
Specialty: Phosphate Mining Reports.
Sampling Works, analyze everything.
8 Charles St., W. Orange, N. J.

GUNN, GEO. E.,
MINING ENGINEER,
Specialty: Mine Examinations.
204 Dooly Block, Salt Lake City, Utah.

HAAS, HERBERT,
METALLURGICAL ENGINEER.
Temporary Office at Union Iron Works, Co., Potrero,
Specialty: Copper and Lead. San Francisco, Cal.
Cable Address: "Herbas." Bedford McNeill Code.

HAGGEN, EDWARD A.,
MINING ENGINEER,
Revelstoke, British Columbia.
Examinations and Reports.

HAMER, A. T. E., M. E.,
MINING ENGINEER,
Specialty: Reports on Nickel, Cobalt and Silver Mines.
Cobalt, Ontario.

HAMMOND, JOHN HAYS,
CONSULTING ENGINEER,
71 Broadway, New York.
43-46 Threadneedle Street, London, E. C.
Codes: Bedford McNeill's and Lieber's.

HARRIS, FREDERICK S.,
MINING ENGINEER,
1717 Railway Exchange, Chicago, Ill.
Telephone: Harrison 2902.
Cable Address: Porphyry. Code: Bedford McNeill.

HARVEY, F. H.,
MINING AND CONSULTING ENGINEER,
Galt, California.

HELM, J. D.,
MINING ENGINEER,
Mine Examinations, Management. Equipment Reports.
Reports & Estimates Gas Engine & Gas Producer Installations.
Office: 408 Mutual Life Building, Apartado Postal 2133.
Mexico City Mexico.

D. E. Heller. H. J. Wright.
HELLER & WRIGHT,
MINING AND METALLURGICAL ENGINEERS,
ASSAYERS AND CHEMISTS,
Douglas, Arizona.

HERR, HIERO B.,
CONSULTING ENGINEER,
Monadnock Block, Chicago, Ill.

HERZIG, C. S.,
ENGINEER OF MINES,
62 London Wall, London, E. C., England.
Care Bewick Moreing & Co.

HEWITT-CARSTARPHEN CO.,
ENGINEERS,
221 McPhee Bldg., Denver, Colorado.
Geological Examinations and Genesis of Ore Deposits.
Hydraulic Engineering, Steel Mill Building and Power,
Transmission Systems a specialty.

HEYWOOD, WILLIAM A.,
METALLURGIST,
Butte, Montana.
Smelter Manager Pittsburgh & Montana Copper Company.

HILL, F. A.,
COAL MINING A SPECIALTY,
609 Mutual Life Building,
Seattle, Washington.

HILL, ROBERT T.,
MINING GEOLOGY AND ENGINEERING,
Room 807, Trinity Building,
New York.

Victor G. Hills. Frank G. Willis.
HILLS & WILLIS,
MINING ENGINEERS,
Cripple Creek, Colo.
Cable Address: "Hillwill," Cripplecreek.
Codes: Western Union, Moreing & Neal, Bedford McNeill.

HOBSON & CO., FRANCIS J.,
MINING ENGINEERS AND METALLURGISTS,
Consulting Metallurgists for
The San Prospero Milling Co.,
The Guanajuato Reduction Mines Co.,
The Peregrina M. and M. Co.,
The Baisas Valley Co.,
Cia Beuna Vista y Anexas.
Mine Examinations, Assays and Analysis,
Mill runs made on lots of ore up to 100 tons.
Apartado 42. Guanajuato, Mexico.

HODGE, BENJAMIN,
MINING ENGINEER,
Specialty: Zinc Mining.
Laboratory: Platteville, Wis.

HOFFMANN, ROSS B.,
MINING ENGINEER,
566 31st Street, Oakland, California.

HOLDEN, EDWIN C.,
MINING ENGINEER,
74 Wall St., New York City.

HOLLAND, CHAS H.,
METALLURGIST AND ANALYTICAL CHEMIST,
Examinations and Superintendence of Properties,
P. O. Box 415 Auckland New Zealand.
Cable Address: "Reduction," Auckland. Code: Moreing & Neal.

HOLLAND, L. F. S.,
MINING ENGINEER AND METALLURGIST,
Supt. of Mines, Smuggler-Union Mining Co.,
Telluride, Colorado.

HOLLIS, H. L.,
MINING ENGINEER AND METALLURGIST,
1417 First National Bank Building, Chicago.

HOLLOW, JAMES T.,
MINING ENGINEER,
Barberton, South Africa.

HOLMES, GEORGE L., A. S. M. E.,
CONSULTING ENGINEER,
Placer Dredging.
140 Santa Clara Ave., Oakland, Cal.

HOLMS, W. L.,
METALLURGICAL ENGINEER,
Calle de Tiburcio No. 18,
P. O. box 1172, Mexico, D. F.
Cable Address: "Holms" Code: Bedford-McNeill.

HUGHES, THOMAS,
CONSULTING MINING ENGINEER,
Box 255, Tucson, Arizona.
Prest. Mineral Hill Copper & Gold Company.

HUNT, ELLERY W.,
CIVIL AND MINING ENGINEER,
U. S. Deputy Mineral Surveyor.
Silverton, Colorado.

HUNT, ROBERT W., & CO.,
Bureau Inspection, Tests and Consultation.
Chemical Analyses, Physical Tests.
Inspections and Reports.
1121 The Rookery, Chicago.
66 Broadway, New York.
Monongahela Bank Bldg., Pittsburg.
31 Norfolk House, London.

HUNTLEY, D. B.,
MINING ENGINEER AND METALLURGIST,
1259 Webster Street, Oakland, Cal.

HUTCHINS, J. P.,
MINING ENGINEER,
52 Broadway, New York.

HUTCHINSON, W. SPENCER,
MINING ENGINEER,
101 Milk Street, Boston, Mass.

JAMME, GEORGE, JR.,
MINING ENGINEER.
Examinations and Management of Properties.
Alaska and Pacific Northwest.
Seattle, Wash.

JANIN, STEBBINS AND SMITH,
CONSULTING MINING ENGINEERS,
38 MacDonough Bldg., Oakland, California.
Cable: "D'or'te" Code: Bedford-McNeill.

JENKS, ARTHUR W.,
MINING ENGINEER AND METALLURGIST,
933 Eleventh Street,
San Diego, California.

JENNINGS, E. P.,
MINING ENGINEER,
Salt Lake City, Utah.
P. O. Box 841.

JONES, CHARLES COLCOCK,
CONSULTING MINING ENGINEER.
Advising Engineer to Union Phosphate Co.,
Late Mining Engineer to the Mountain Copper Co., Ltd
247 Pacific Electric Building, Los Angeles, Cal.

JUESSEN, EDMUND,
MINING ENGINEER,
604 Montgomery Street, San Francisco, Cal.
Hypotheek-Bank Building, Spokane, Wash.

KEDZIE, G. E.,
MINING AND CONSULTING ENGINEER,
Examination and Development of Mexican Mines,
Durango, Mexico.

KELLY & CHAPMAN,
CIVIL AND MINING ENGINEERS,
Coal, Iron, Copper, Hydraulic Power and Railways.
512-513 Provident Bldg., Tacoma, Wash.

KEMPTON, C. W. & P. B. McCOY,
MINING ENGINEERS,
Mining, Milling, Exploration.
29 Broadway, New York.
Cable Address: "Macton," New York.
Code: Western Union.

KENNEDY, JULIAN,
ENGINEER,
The Bessemer Bldg., Sixth St. and Duquesne Way,
Pittsburg, Pa., U. S. A.
Cable Address: "Engineer," Pittsburg.

KING, JACOB,
MINING ENGINEER,
Clifton, Ariz.

KING, LOCHIEL M.,
METALLURGIST, ASSAYER AND CHEMIST.
Complete Ore Testing. Ore Treatments Devised, Assaying and Analyses. Office and Laboratory, 1311 Franklin St., Oakland, Cal. (R. F. D. Postoffice.)

KIRBY, EDMUND B.,
CONSULTING MINING ENGINEER AND METALLURGIST,
Examination of Mining Investments and Enterprises.
701 Security B dg., St. Louis, Mo.

KLEPETKO, FRANK, E. M.,
CONSULTING ENGINEER,
MINING AND METALLURGY,
Specialty: Metallurgy of Copper.
Offices: 307 Battery Park Building,
21-24 State Street, New York City.
Lately Manager Boston and Montana Consolidated Copper and Silver Mining Company and of the Reduction Works of the Anaconda Copper Mining Company of Montana.
At present Consulting Engineer Cerro de Pasco Mining Company of Peru, Boston and Montana Consolidated Copper and Silver Mining Company of Montana, and Michigan Copper Smelting Company of Michigan.

KNOX & ALLEN,
MINING AND METALLURGICAL ENGINEERS,
82 Beaver St., New York.
Cable Address: "Allenox," New York.

KNOX, NEWTON BOOTH,
MINING ENGINEER,
Care Pollak Brothers, Yokohama, Japan.
Cable Address: "Newtknox" Yokohama.

KNOX, SCHLAPP & CO.,
MINING ENGINEERS AND METALLURGISTS.
163-169 William St., Melbourne, Australia.

LAIRD, GEORGE A., E. M.,
Copper Queen Consolidated Mining Co.'s
Sierra de Cobre Mines.
Cananea, Sonora, Mexico.

LAMMERS, THEO, L.,
MINING AND CONSULTING ENGINEER,
509 Peyton Building, Spokane, Washington.
Code: Moreing & Neal.

LANDES HENRY,
CONSULTING GEOLOGIST,
Consultations, Examinations, Reports.
Professor of Geology, University of Washington.
Seattle, Washington.

LAWRENCE, BENJAMIN B.,
CONSULTING MINING ENGINEER,
60 Wall Street, New York.

LAWRENCE, T. J.,
MINING ENGINEER,
Examinations, Reports, Assays and Analyses.
Plants Designed and Constructed.
Topia, Durango, Mexico.
Cable Address: Simigo. Code: Lieber.

LEFEVRE, HENRY F.,
CONSULTING MINING ENGINEER,
Management, Examination, Explorations, Consultation in Nicaragua, Honduras, Salvador, Costa Rica and Guatemala.
Managua-Nicaragua Cable address, Lefevre-Managua
Room 816, 71 Broadway, New York City. Cable Address, Sobajor, New York.
Bedford-McNeill Code.

LEGGAT, ALEXANDER,
MINING ENGINEER,
P. O. Box 15, Butte, Montana.

LEGGETT, THOS. HAIGHT,
CONSULTING MINING ENGINEER,
Salisbury House, London, E. C., Eng.
Cable Address: "Descension," London.

LIDNER, P. G.,
MINING ENGINEER,
Examinations, Reports, Management.
130 Lexington Ave., New York.

LINEBERGER & RONE,
CIVIL AND MINING ENGINEERS,
Surveys, Plans, Estimates, Reports,
Estación de Pedriceña, Dgo., Mexico.

LISBOA, M. ARROJADO R.,
CONSULTING, MINING AND CIVIL ENGINEER,
Rua Santos Dumond, No. 5, Petropolis,
Rio de Janeiro, Brazil.
Mining Examinations; Reports; Consultations.
Cable Address: Lisboa. Code: Bedford McNeill.

LITTLEFIELD, J. F.,
CONSULTING MINING AND MECHANICAL ENGINEER.
Examinations, Plans and Reports.
67 Flood Building, SAN FRANCISCO, CAL. 809 Market St.

LLOYD, R. L.,
Superintendent Reduction Division,
Cananea Consolidated Copper Company,
Cananea, Sonora, Mexico.

LONG, FREDERIC H.,
CONSULTING MINING AND METALLURGICAL ENGINEER,
Schiller Bldg., Chicago.

LORING, FRANK C.,
MINING ENGINEER,
1103 Monadnock Building, Chicago, Ill.

LORING, W. J.,
MINING ENGINEER,
Australasian Representative Bewick Moreing & Co.,
Melbourne, Australia,
Cable Address: "Loring, Melbourne." Codes: Moreing & Neal, Bedford-McNeill, Lieber, Western Union.

LUKIS, ERNEST du B.,
MINING ENGINEER,
General Manager of the Cerro de Pasco Tunnel Mining Co.,
Lima, Peru.

MACDONALD, BERNARD,
CONSULTING MINING ENGINEER.
Spokane, Wash.
Cable Address: "Maclerol," Spokane.

MALCOLMSON, JAMES W.,
MINING ENGINEER,
Mills Bldg., P. O. Box 327,
El Paso, Texas.

MANDELL, FRANK C.,
MINING ENGINEER,
Hailey, Idaho.

MANSFIELD, HARVEY M.,
MINING ENGINEER,
Manager Georgia Pyrites Company,
Temple, Georgia.

MARSTERS, V. F., A. M.,
CONSULTING GEOLOGIST AND PETROGRAPHER,
Geologist to the Republic of Peru,
Sub-Station 84, New York City. Lima, Peru, So. America.

MATHIS, T. S.,
MINING ENGINEER,
407 Mills Bldg., San Francisco, Cal.

MAYNARD, GEORGE W.,
CONSULTING MINING AND METALLURGICAL ENGINEER.
Rooms 40 to 50, No. 20 Nassau St., N. Y.

McCAUSTLAND, E. J.,
M. AM. SOC. C. E., A. M. E.,
Mining Propositions Examined for Investors only.
Cornell University, Ithaca, New York.

McCLELLAND, J. F.,
MINING ENGINEER,
Tonopah, Nevada.
Code: Bedford-McNeill.

McCORD, WILLIAM H.,
ENGINEER,
Apartado 2405. Mexico City, Mexico.

A. L. McEwen. John Arthur. K. D. McEwen.
McEWEN, ARTHUR & McEWEN,
MINING ENGINEERS,
Consultations, Examinations, and Mill Installations.
Sumpter, Oregon.

McLENNAN, JOHN F.,
MINING ENGINEER,
Examinations, Reports, Superintendence.
Fifteen Years' Experience throughout the West.
Texas Flat Mines Co.,
Coarsegold, California.
Correspondence Solicited.

MEGRAW, HERBERT A.,
MINING AND METALLURGICAL ENGINEER,
Hotel Bellevue, High Point, N. C.

MERRILL, FREDERICK, J. H.,
CONSULTING GEOLOGIST,
225 West End Avenue, New York.

MESSITER, E. H.,
ENGINEER.
Room 2700, Park Row Bldg., New York.

C. B. Murray. S. T. Piero. G. P. Maury.
METALLURGICAL LABORATORY, THE.
Bureau of Inspection.
Analytical Chemists, Chemical and Mining Engineer.
611 Bailey Farrell Bldg., Pittsburg, Pa.
Examination of Properties. Consultations.

MILLEN, J. D., F. G. S., F. C. S.,
CONSULTING MINING AND METALLURGICAL ENGINEER,
Metallurgical Engineer Mt. Bischoff Tin Mining Co., Consulting Mining Engineer, Togo Tin Mining Co., Bonanza, G. M. Co. Specialty: Tin. Launceston, Tasmania, Australia.
Cable Address: "Tin," Launceston. Code: Bedford-McNeill.

MILLER, IRVING,
MINING ENGINEER AND GEOLOGIST,
Manhattan, Nye County, Nevada.

MILLER, W. CLAYTON,
MINING ENGINEER,
General Manager, Federal Mining and Smelting Co.,
Spokane, Wash.

MINARD, FREDERICK H.,
MINING ENGINEER,
407 Equitable Bldg., Denver, Colo.
Cable Address: "Minard," Denver.
Code: Bedford McNeill. Telephone, 1611.

MITCHELL, D. P.,
MINING ENGINEER,
Manager Oroya-Brownhill Company, Limited,
Box 57, Kalgoorlie,
Western Australia.

MOLSON, C. A.,
MINING ENGINEER,
Dooly Building, Salt Lake City, Utah.
Cable Address: "Molson," Salt Lake.
Codes: Bedford-McNeill, Moreing & Neal.

MORGAN, DONALD R.,
MINING ENGINEER,
Plaza Bolivar No. 16, Monterrey, N. L., Mexico.
Examination and Management of Mines in Mexico.
Cable, "Donmor," Monterrey, (Mex.) Code: Bedford-McNeill.

MORROW, JOHN T., M.E.E.E.,
CONSULTING ENGINEER,
NEW YORK: 24 Broad Street, PARIS: 37, Bd. Haussmann.

MUDD, SEELEY W.,
MINING ENGINEER,
1103-4 Braly Building, Los Angeles, Cal.
Code: Bedford McNeill.

MUSGRAVE, E C.,
MINING ENGINEER,
Reports and Management,
Victoria, B. C.

NAHL, ARTHUR C.,
CONSULTING ENGINEER,
Triunfo, Baja California, Mexico.

NASON, FRANK L.,
GEOLOGIST AND MINING ENGINEER,
Development, Examining and Reporting on all kinds of Mines and Mining Properties.
Telephone 5562-16. West Haven, Conn.

NEILL, JAMES W.,
CONSULTING, MINING AND METALLURGICAL ENGINEER,
Pasadena, California. Salt Lake City, Utah.
Cable: "Gymneil." Bedford-McNeill Code.

NICHOLS, RALPH, E M. & C. E.,
CONSULTING MINING ENGINEER,
140 Benton St., Aurora, Illinois. Cable Address: "Nichols," Aurora, Illinois. London Address: Care F. F. Fuller, Esq., 138 Salisbury House, London Wall, London, E. C., Eng.

NICHOLSON, FRANK,
CONSULTING ENGINEER,
Miners Bank Building,
Joplin, Mo.

NICHOLSON, HUDSON H.,
CONSULTING MINING ENGINEER,
901 Merchants' Loan and Trust Building,
Chicago, Ill.

Peter N. Nissen, Pres. A. Von Krassow, Secy. J. M. Nissen, Treas.
NISSEN ENGINEERING CO., THE,
PATENTEES OF THE
NISSEN STAMP MILL
Designers and Erectors of Stamp Mills, Concentrating and Cyanide Plants.
Get our estimate for a modern cost Reducing Plant.
Suite 705, Lankersheim Building, Los Angeles, Cal.

NOURSE, C. F.,
CIVIL AND MINING ENGINEER,
Mine Examination and Surveys,
Room 193, Crocker Building, San Francisco, Cal.

NOYES, WILLIAM S.,
MINING ENGINEER,
Albany Block, Oakland, Cal.

E. E. Olcott. C. R. Corning. Robt. Peele.
OLCOTT, CORNING & PEELE,
CONSULTING MINING AND METALLURGICAL ENGINEERS.
36 Wall St., New York. Cable: "Kramolena."

OVERSTROM, GUSTAVE A.,
CONSULTING ENGINEER,
Mill and Smelter Construction.
Specialty: Concentration of Ores.
University of Utah,
Salt Lake City, Utah.

PACKARD, GEORGE A.,
METALLURGIST AND MINING ENGINEER,
Wakefield, Mass.
Boston Office: 50 Congress Street.

PARKER & PARKER,
MINING AND CONSULTING ENGINEERS,
El Paso, Texas.
Examinations and Reports on Mining Properties.
Cable Address: "Parker" Western Union Codes.

PARRISH, S. F.,
MINING ENGINEER,
La Jolla, San Diego County, California.
Code: Bedford McNeill.

PEACOCK, S,
METALLURGICAL TECHNOLOGY,
Landore, Idaho,

PEARSE, KINGSTON & BROWNE,
MINING ENGINEERS AND MANAGERS,
Worcester House, Walbrook, London, E. C., and at Mills Building, New York, U. S. A.
Cable "Undermined." Bedford-McNeill Code.
Agents in all the principal mining centers.

PELLEW-HARVEY & FELL,
MINING ENGINEERS AND METALLURGISTS,
31 Walbrook, London, E. C.
W. Pellew-Harvey, F. C. S., M. I. M. M.
E. Nelson Fell, A. R. S. M. M. A. I. M. E., M. I. M. M.

PERRY, O. B.,
MINING ENGINEER,
Rialto Bldg., San Francisco, Cal.

PETERS, EDWARD D.,
MINING ENGINEER AND METALLURGIST,
Address all Letters and Telegrams
38 Percival St., Dorchester, Mass.
Cable Address: "Peters," Boston.

PETERSON, BERT,
MINING ENGINEER,
Estacion, Ahorcado, Queretaro, Mexico.
Bedford McNeill and Moreing & Neal Codes.

PETTIT, ARTHUR, E.,
MINING AND MECHANICAL ENGINEER,
8 Old Jewry, London, E. C., England.

PHILLIPS & COMPANY, WM. B.,
ENGINEERS AND CHEMISTS,
Birmingham Testing Laboratory,
Birmingham, Alabama.

POMEROY, WM. A.,
MINING ENGINEER,
Cable Address: "Wepawa"
Chinipas, Chihuahua, Mexico.
Codes: Bedford-McNeill, Moreing & Neal.

PRICHARD, W. A.,
MINING ENGINEER,
Apartado No. 1060, Mexico City, Mex.
Cable, "Parallel-Mexico City".

PRITCHETT, C. W.,
MINING ENGINEER,
2735 Boulevard F, Denver, Col.
Specialty: Examinations in Mexico.

PROBERT, FRANK H.,
CONSULTING MINING ENGINEER,
230-231 Bradbury Bldg., Los Angeles, Cal.
Codes: Western Union and Bedford McNeill.

PURDUE, A. H.,
CONSULTING GEOLOGIST,
Professor of Geology, University of Arkansas,
Fayetteville, Ark

QUENEAU, A. L.,
MINING ENGINEER AND METALLUGIST,
South Bethlehem, Pa.

RALSTON, JOHN C.,
MINING ENGINEER,
464 Eleventh Street, Oakland, California.
Bedford-McNeill Code.

RANDOLPH, JOHN C. F.,
CONSULTING MINING ENGINEER,
Mills Bldg., 15 Broad and 35 Wall, N. Y.
Cable address: "Rhosgog," New York.
Codes: Moreing & Neal, Bedford McNeill

RAYMOND, ROSSITER W.,
MINING ENGINEER AND METALLURGIST,
99 John St., New York. P. O. Box 223.

REBBECK, JAMES, K.,
CONSULTING MECHANICAL ENGINEER,
Steamers Designed, Quotations on Machinery.
Plans, Specifications. Special Designs. Reports, Surveys and Supervision.
Rooms 32-33 Board of Trade Building, Victoria, B. C.

REED, DAVID CARLYLE,
MINING AND CIVIL ENGINEER,
580 Leonde Andrade, Lima, Peru, S. A.
Cable Address: "Decreed," Lima.
Codes: A. B. C., Liebers, Bedford-McNeill.

REVETT, BEN STANLEY,
MINING ENGINEER,
Alluvial Mining and Installations.
Breckenridge, Colo.

RICE, L. M.,
CIVIL AND MINING ENGINEER,
Consultations and Exploitations.
603-604 Pacific Block, Seattle, Wash.

RICHARDS, H. DeC.,
MINING ENGINEER,
Address Cosmos Club, San Francisco.
Specialty, Economic Organization and Management.
Bank References: New York, Salt Lake City, San Francisco.

RICHARDS, ROBERT H.,
ORE DRESSING.
Massachusetts Institute of Technology,
Boston, Massachusetts.

RIEBLING, H. F. A.,
METALLURGICAL ENGINEER,
Milling Propositions Examined and Plants Installed. Cyaniding a Specialty.
Temporary Address: Parsons, N. M.

RIORDAN, D. M.,
CONSULTING ENGINEER,
Mining Investigations especially carefully made for responsible intending investors.
42 Broadway, New York City.

ROBBINS, PERCY A.,
CONSULTING ENGINEER,
Mechanical and Electrical Equipments for Mines and Works.
60 Wall Street, New York.
Late Consulting Engineer DeBeers Consolidated Mines, Ltd.

ROBINSON, G. H.,
MINING ENGINEER,
Salt Lake City, Utah.

ROGERS, ALLEN HASTINGS,
MINING ENGINEER,
Room 810. 71 Broadway,
New York.

ROGERS, A. P.,
MINING ENGINEER,
757 Railway Exchange Building, Chicago, Ill.
Code: Bedford-McNeill.

ROGERS, E. M.,
CONSULTING MINING ENGINEER,
32 Broadway, New York, N. Y.

ROHLFING, D. P.,
CONSULTING MINING ENGINEER,
531-2 Atlas Building,
Salt Lake City, Utah.

ROMBAUER, A. B.,
ASSAYER AND CHEMIST,
Butte, Montana.
Mines Examined and Reported on.

ROOTE, GILBERT J., Mem. AM.I.M.E.
MINING ENGINEER,
456 Montgomery Street,
San Francisco, Cal.

RUTLEDGE, J. J., PH. D.,
MINING ENGINEER AND GEOLOGIST,
Specialties: Coal, Iron and Pyrites,
Surface Prospecting, Diamond Drilling, Mine Equipment,
213 Courtland Street, Baltimore, Md.

SANDERS, WILBUR E.,
MINING ENGINEER,
Helena, Montana.

SCHIERTZ, F. A.,
METALLURGIST AND MINING ENGINEER,
Specialty: Gold, Silver, Lead,
Apartado 19, Tlalpujahua,
Est. de Michoacan, Mexico.

SCHROTER, GEO. A.,
MINING ENGINEER,
Denver, Colorado,
Care Venture Corporation, Ltd., Trinity Bldg., New York.
Code: Bedford-McNeill.

SCHWARZ, THEODORE E.,
MINING ENGINEER,
Management, Examination and Development of Mines.
Office: 204 Colorado Bldg., Denver, Colo.

SCOBEY, JESSE CARLTON,
CONSULTING MINING ENGINEER,
Cable Address: "Scobey,"
Home Address: 3424 Colfax Ave., "B," Denver, Colorado.

SCOTT, HERBERT KILBURN,
CONSULTING MINING ENGINEER,
16 St. Helens Place, London, Eng.
Cable Address: "Jacutinga," London.

SEAMON, W.H., Mem.AM.C.S., AM.I.M.E.
CHEMIST AND MINING ENGINEER,
236 Avenida de Independencia, Apartado 247,
Chihuahua, Mexico.

SEBBEN, EDW. W., Mem. Am. Inst. M. E.
MINING AND CONSULTING ENGINEER,
Mines Examined. Reports Made.
412 Commonwealth Building, Denver, Colorado.
Code Moreing & Neal.

SHARPLESS, FRED'K F,
CONSULTING MINING ENGINEER,
with the Consolidated Mines Selection Co., Limited,
of London. 52 Broadway, New York.
Cable Address: "Fresharp," N. Y. Bedford-McNeill Code.

SHAW, RICHARD C.,
MINING ENGINEER AND METALLURGIST,
General Manager, Montezuma Mine, Inc.,
Cable Address: Miramar, Costa Rica, C. A.
"Shaw," Miramar, Costa Rica. Code: Bedford McNeill.

SHIPMAN, H. A.,
MINING ENGINEER,
415 Mining Exchange Building, Denver, Colorado,
Cable Address: "Shipman." Code: Bedford-McNeill.

SIMONDS & WAINWRIGHT,
MINING ENGINEERS,
60 Wall Street, New York.

SIZER, F. L.,
CONSULTING MINING ENGINEER.
Specialty: Mine Examinations.
Helena, Montana.

SMITH, ALFRED MERRITT,
MINING ENGINEER AND METALLURGIST,
Metallurgy of Gold and Silver Ores.
Mine Examinations and Reports.
Thorough knowledge Central America.
Manager Colburn Mines Co., Puntarenas, Costa Rica.
Puntarenas, Costa Rica, Central America.
Code: Bedford-McNeill.

SMITH, FRANKLIN WHEATON,
MINING ENGINEER,
Bisbee, Arizona.
Code: Bedford McNeill.

SNEDAKER, JAMES ANGUS,
MINING ENGINEER,
850 Equitable Bldg., Denver, Colo., U. S. A.
Codes: Western Union and Bedford-McNeill.
Cable Address: "Snedaker," Denver.

SPACKMAN ENG. CO., HY. S.,
INDUSTRIAL AND CHEMICAL ENGINEERS
Also Designing and Installation of Conveying and Crushing Machinery.
Office and Laboratories, 42 N. 18th St. Phila, Pa.

SPALDING, E. P.,
MINING ENGINEER,
Manager Monarch Mining Co., Ltd.
Examinations and Reports.
Bedford McNeill Code. Murray, Idaho.

SPILSBURY, E. GYBBON,
CONSULTING, CIVIL, MINING AND METALLURGICAL ENGINEER,
45 Broadway, New York,
Cable Address: "Spilroe," New York.

STADELMANN, G.,
CONSULTING MINING ENGINEER,
Apartado 529,
Avenida Morelos No. 4, Mexico.

STANFORD, RICHARD B.,
MINING ENGINEER,
Manager The Siempre Viva Mines,
Bluefield, Nicaragua, Central America.
Low Grade Gold Ores a Specialty. Code: Bedford-McNeill.

STEPHENS, A. H.,
ELECTRICAL AND MECHANICAL ENGINEER,
Mining Plants designed and Installed,
816 West Mercury St., Butte, Montana.

STEVENS, ARTHUR W.,
MINING ENGINEER,
Assayer and Chemist. Mines examined and reported upon.
12 years' Practical Experience in Mining.
First National Bank Building, Chicago, Ill.

STEVENS, W. A.,
formerly of Idaho,
now operating in Nevada.
Address: Carmel Ave., Piedmont, Cal.,
and Goldfield, Nevada.

STONESTREET, G. D.,
CONSULTING MINING ENGINEER,
Late Inspector of Mines, Transvaal.
45 Broadway, New York.

STOW, A. H.,
MINING ENGINEER,
Chief Engineer Pocahontas Consolidated Co.
Maybeury, McDowell Co., W. Va.

SUSSMANN, OTTO, Ph. D.,
MINING ENGINEER,
52 Broadway, Atlas Block,
New York. Salt Lake City, Utah.

SUSTERSIC, FERDINAND,
MINING ENGINEER AND METALLURGIST,
Etzatlan, Jalisco, Mexico.

H. C. Swann. M. McCain.
SWANN & McCAIN CO.,
ELECTRICAL AND CONSULTING ENGINEERS,
Consultation in Electrical and Installation of Power Plants.
308 Post Street, Spokane, Wash.

W. T. Swoyer. E. Van Dreveldt.
SWOYER & VAN DREVELDT,
CONSULTING MINING ENGINEERS,
P. O. Box 91, Parral, Chihuahua, Mexico.

TANNER, WALLACE N.,
CONSULTING MECHANICAL AND MINING ENGINEER,
Specialty: Copper Smelting and Concentration of Ores. Lately Engineer Mining Department Allis-Chalmers Co. Previously Chief Draughtsman Anaconda Copper Mining Co's. Reduction Works, Anaconda, Montana.
Office: 316 Dooly Block, Salt Lake City, Utah.

TAYS, E. A. H., (M. AM. SOC. C. E.)
MINING ENGINEER,
Fuerte, Sinaloa, Mexico.
Large, varied and successful mining experience in Mexico.
Management of Mexican properties a specialty.

THAYER, B. B.,
MINING ENGINEER,
Room 2000, 42 Broadway, New York, N. Y.
Code: Bedford-McNeill. Cable Address: "Reyabt."

C. Henry Thompson. Lane C. Gilliam.
THOMPSON & GILLIAM,
MINING ENGINEERS,
Examinations and reports on mines. Best bank references.
Codes: Moreing & Neal, Bedford-McNeill. Cable Address,
"Thogil," 509 Union Trust Building, Los Angeles.

THYNG, W. S.,
MINING ENGINEER,
Mine Examinations and Management.
511 Empire State Bldg., Spokane, Wash.
Code: Bedford McNeill.

TIMMONS, COLIN,
MINING ENGINEER,
Examinations and Exploration in Mexico.
Taxco, Guerrero, Mexico.

TITUS, N. C.,
CONSULTING MINING ENGINEER,
Hanover, New Mexico.

TOLL, RENSSELAER H.,
ENGINEER OF MINES,
Examinations, Reports, Consultation.
Mancos, Colo.

TOMLINSON, B. J., NORTON, N, B.
CONSULTING MINING ENGINEERS,
Examinations, Plans and Reports.
Cananea, Son., Mex., and Prescott, Ariz.
Bedford McNeill Ming. Code.

TONKING, JAS. B.,
CONSULTING MINING ENGINEER,
Zinc and Iron Properties a specialty.
Formerly with the New Jersey Zinc Company.
100 Broadway, New York City.

TOWNSEND ARTHUR R.,
MINING ENGINEER,
Mines Examined and Reported on,
114 Liberty St, N. Y. Telluride, Colo.
Code Bedford-McNeill

TREADWELL, JOHN C.,
Manager Sahuayacan Mining Co.
Will make examinations in Western Chihuahua.
Bedford McNeill Code.
Ocampo, Chihuahua, Mex.

TREGO, FRANK H.,
CONSULTING ENGINEER,
ZINC MINING AND CONCENTRATION,
General Offices, Platteville, Wis.
Lately: General Manager of Castle Dome Mining Co., Saguaro Gold Quarry Co., and Yellow Jacket Mining Co., of Arizona.
At present: General Manager of the Platte Zinc Mining Co., The Square Deal Mining Co., the Hoskins Mining Co., of Wisconsin, and the Marsden Blackjack Mining Co., of Illinois.

TRENT, L. C.,
CONSULTING MINING ENGINEER,
3201 Pacific Avenue, San Francisco, Cal.
Cable Address, "Lamartine," San Francisco.

Scott Turner. Charles C. Gates.
TURNER & GATES,
MINING ENGINEERS,
Examinations and Reports on
Nevada Properties.
Offices: Manhattan and Jefferson, Nevada.
Codes: A. B. C. and Bedford-McNeill.

TUTTLE, EDGAR G., E. M.,
COPPER, IRON & COAL MINING—CONCENTRATION.
30 Fishers Lane, Germantown, Pa.
Formerly with: Cambria Iron Co., Mexican International Ry. Lewisohn Bros.; El Cobre Mines, Cuba.

TYRRELL, J. B.,
MINING ENGINEER
for Mackenzie, Mann & Co., Ltd.,
9 Toronto Street, Toronto, Canada.

VON LEER, I. WAYNE,
M. AM. SOC. C. E. M. A. I M. E.
MINING, CIVIL AND HYDRAULIC ENGINEERING,
General Manager El Carmen Copper Co.
Specialties: Economic Management. Reliable Reports. Development Work.
El Carmen, Durango, Mexico, or
813 Drexel Bldg., Philadelphia, Pa.
Correspondence Solicited. Spanish Spoken.

WALLACE, H. VINCENT,
CONSULTING MINING ENGINEER.
Nogales, Arizona.
Codes: Moreing & Neal Bedford-McNeill, Anglo-American.

WATSON, R. B,
MINING ENGINEER.
Consulting Engineer to Shannon Copper Co.
52 Broadway, New York City.

WATTERS., D. M.,
MINING ENGINEER AND METALLURGIST,
P. O. Box 865. Baker City, Oregon.
Code: Moreing & Neal.

WEINBERG, E. A.,
MINING AND METALLUGICAL ENGINEER.
Specialty: New Organization of Metallurrical Works for Copper, Lead, Zinc and Nickel.
The Chillagoe Co., Ltd., 39 Queen St. Melbourne, Aus.

WEISEL & KOCK,
ENGINEERS AND CONTRACTORS,
Apart. 64 Bis., Parral, Chihuahua, Mexico.
Ten years' experience in the Parral District and Mexico.
Correspondence Solicited.

WELCH, MAX J., M E.,
CONSTRUCTION ENGINEER,
321 So. Olive St., Los Angeles Cal.

WENSTROM, OLOF,
CONSULTING MINING ENGINEER,
COPPER.
Room 53, 113 Devonshire St., Boston, Mass.

WHEELER, H. A.,
MINING ENGINEER,
510 Pine St., St. Louis, Mo.
Cable: "Wah," St. Louis.

WHITE, EDW. FRANCIS, M. E.
SULPHUR APPARATUS,
Mine Examinations and Ore Sample Tests for development of Native Sulphur Deposits.
P. O. Box 637, New York City.

WHITE & COMPANY, J. G.,
Corporated.
ENGINEERS, CONTRACTORS,
43-49 Exchange Place, 41-43 Wall St., New York, N.Y.
London Correspondents:
J. G. White & Co., Ltd., 22a College Hill, Cannon St.
Canadian Correspondents:
Canadian White Co., Ltd., Montreal.
Principal Philippine Office, Manila, P. I.

WILEY, W. H.,
MINING ENGINEER,
Idaho Springs, Colo.

WILSON, HAROLD, B.Sc. M.INST.M.M.,
MINING ENGINEER,
Examinations, Advice or Management.
Code: Bedford-McNeill. Present Address, Pearl, Colo.

WILLIAMS, PERCY,
MINING ENGINEER,
Specialist on South-Western and Mexican Copper Mining and Metallurgical Enterprises.
Moreing & Neal Code. Tucson, Arizona.

WILLMOTT, A. B., AIME, FGS..
Superintendent of Mines,
The Lake Superior Corporation.
Reports on Nickel, Iron and other Minerals in Ontario.
SAULT STE. MARIE, CANADA.
Codes: Western Union, Liebers.

WOOD, GEORGE R.,
ELECTRICAL MINING ENGINEER.
Complete Electrical Coal Mining Plants.
Estimates, Examinations and Reports.
Farmers' Bank Bldg., Pittsburg, Pa.

WORCESTER, S. A,
CONSULTING MECHANICAL ENGINEER,
Labor-Saving Mining, Milling and Ore Handling Plants.
207 South 5th Street, Victor, Colorado.

WORD, WILLIAM F.,
MINING ENGINEER,
Helena, Montana.

WRIGHT, LOUIS, A.,
MINING ENGINEER,
koom 1445, 42 Broadway, New York.
Code: Bedford-McNeill.

WYER, S. S., M. E.,
PRODUCER GAS SPECIALIST,
Columbus, Ohio.
Reports, Specifications. Designs for complete plants. Expert testimony in Patent causes.

YEATMAN, POPE,
MINING ENGINEER,
71 Broadway, New York.
Code: Bedford McNeill.

YOUNG, ROBERT,
CONSULTING AND MINING ENGINEER,
Investigations and Reports.
Tacoma, Wash.

YUNGE, GUILLERMO,
MINING ENGINEER,
Specialty: Reports on Copper and Gold Mines.
Santiago, Chile.

DIRECTORY OF ASSAYERS, CHEMISTS, ETC.

BOGGS, G. W., C.E.,
ASSAYER, CHEMIST AND CYANIDE EXPERT,
Care of Geiser Grand Hotel, Baker City, Ore.
Reports, Specifications, Examinations and Cyanide Tests.
Correspondence Solicited.

BURLINGAME, E. E., & CO.
Established 1866.
ASSAYERS AND CHEMISTS,
Dealers in Gold and Silver Bullion.
1736-38 Lawrence St., Denver, Colo.

BURTON, HOWARD E,
ASSAYER AND CHEMIST,
Leadville, Colorado.
Specimen Prices: Gold, Silver, Lead, $1.00; Gold, Silver, 75c.; Gold, 50c.; Zinc or Copper, $1.00. Cyanide Tests.
Mailing Envelopes and full price list sent on application.
Control and Umpire Work Solicited.
Reference: Carbonate National Bank.

CARPENTER & CO., CHAS. W.,
ASSAYERS AND CHEMISTS,
Specialty: Umpire and Control.
Ocampo, Mich. and Mexico D. F. Ia. Independencia No. 9.

CRITCHETT & FERGUSON,
Successors to Hughes and Critchett,
ASSAYERS AND CHEMISTS,
Umpire and Control a Specialty. EL PASO, TEX.

Dr. Rudolf Gahl, Manager.
Howard C. Parmelee. Dr. James Underhill.
DENVER LABORATORIES, THE,
ASSAYERS, ANALYSTS, ELECTROCHEMISTS AND METALLURGISTS,
1755 Arapahoe Street, Denver, Colo.

DENVER ORE TESTING AND SAMPLING CO., THE.
Assaying, Ore Testing, Sampling.
Ores tested in carload lots or smaller quantities. Best Equipment. Prompt Service. Reasonable Charges.
527 17th Street, Denver, Colorado.
N. C. Bonnevie, General Manager.

EBERENZ, GEO B.,
Assay Office and Chemical Laboratory,
Junction Victoria and Union Avenues,
Pueblo, Colorado.

FALKNEAU ASSAYING CO., INC.,
ANALYTICAL AND TECHNOLOGICAL LABORATORY,
School of Assaying, Analytical and Technical Chemistry.
Top Floor of Polytechnic Business College,
Corner Twelfth and Harrison Streets, Oakland California.

HANKS, ABBOT A.,
ASSAY OFFICE, CHEMICAL LABORATORY,
Control and Umpire Assays,
Supervision of Sampling at Smelters.
1104 Broadway, Oakland, California.

KYLE, T. D., & CO.,
ASSAYERS AND CHEMISTS,
Samples by Mail Receive Prompt Attention.
Mill Tests of All Kinds.
P. O. Box 626, Leadville, Colo.
Telephone 22.

LEONARD & ROOT,
ASSAYERS AND CHEMISTS,
1744 Broadway,
Denver, Colorado.

MINERS' ASSAY OFFICE,
ASSAYERS AND CHEMISTS,
25 Stevenson Street, San Francisco, Cal.
Jno. Harrigan, Proprietor.

OFFICER & CO., R. H.,
ASSAYERS AND CHEMISTS,
169 So. West Temple Street,
Salt Lake City, Utah.

SMITH, EMERY & CO.,
CHEMISTS AND
CHEMICAL ENGINEERS,
Bureau of Inspection and Tests,
Analysis, Tests, Assays and Inspections,
83-85 New Montgomery St., San Francisco, Cal
1104 Broadway, Oakland, California.

M. S. Hanauer. J. V. Sadler.
UNION ASSAY OFFICE,
ASSAYERS AND CHEMISTS,
P. O. Box, 1446. 152 South, West Temple Street, Salt Lake City, Utah.

WALLER & RENAUD,
CONSULTING CHEMISTS,
Chemistry and Assay Laboratories,
159 Front Street, New York.

WERNER, GEO. E.,
ASSAYER AND CHEMIST,
Mill Consultation. Engineers' and Umpire Work a Specialty.
107 N. Spring Street., Los Angeles, Cal.

WOOD, HENRY E., & CO.,
ASSAYERS,
Ore Tested in Car Load Lots. Write for Circulars.
1734 Arapahoe St., Denver, Colo.

ARIZONA COPPER COMPANY
Producers of "A. C. C." Brand and Copper Precipitate.
Mines and Smelters at Clifton, Ariz.
Agents:
UNITED METALS SELLING CO.,
New York.

ATLANTIC MINING COMPANY
JOSEPH E. GAY, President.
JOHN STANTON, Treasurer.
J. R. STANTON, Secretary.
Eastern Office:
11 and 13 William Street, New York.
Main Office:
Atlantic Mine P. O., Houghton Co., Mich.

CASTNER, CURRAN & BULLITT
Sole Agents
C.C.B. POCAHONTAS COAL,
AN UNEQUALLED STEAM FUEL
MAIN OFFICE:
Arcade Building, 1 S. 15th Street, Philadelphia, Pa.
BRANCH OFFICES:
1 Broadway, New York; 70 Kilby St., Boston, Mass.; Citizens Bank Bldg., Norfolk, Va.; Terry Bldg., Roanoke, Va.; Old Colony Bldg., Chicago, Ill.; Neave Bldg., Cincinnati, Ohio; 4 Fenchurch Ave., London, Eng.

Wolverine Copper Mining Company
JOHN STANTON, President.
J. R. STANTON, Secretary and Treas.
Eastern Office:
11 and 13 William Street, New York.
Main Office:
Kearsarge P. O., Houghton Co., Mich.

The Mines Finance Company,
John B. Farish
Consulting Engineer and General Manager,
40 Wall St., New York.
Cable Address, Minefinco.
Is prepared to investigate and finance developed mining properties.

London Mining Shares
EL ORO :-: ESPERANZA
CAMP BIRD :-: TOM BOY
and all other stocks actively dealt in on the London Market
Bought, Sold and Carried on 20% Margin
CATLIN & POWELL CO.
35 WALL STREET, NEW YORK
Telephone, 4488 Broad

W. J. CRAIG,
414 Atlas Block, Salt Lake City, Utah.
Mine Examinations and Reports Made.
Developed and Undeveloped Mines for Sale.

RELIABLE ASSAYS
Gold.....$.75 | Gold and Silver....$1.00
Lead..... .75 | Gold, Silver, Copper 1.50
Samples by Mail receive prompt attention.
Placer Gold Retorts and Rich Ores Bought.
Send for Free Mailing Envs. and Price List.
OGDEN ASSAY CO.
1540 Court Place, Opp. Court House, Denver, Colo.

BERWIND-WHITE COAL MINING COMPANY
Proprietors, Miners and Shippers of
Eureka Bituminous Steam Coal. Ocean Westmoreland Gas Coal
OFFICES: Betz Building - - Philadelphia; 1 Broadway - - - New York; 50 Congress St. - Boston, Mass.
SHIPPING WHARVES: Philadelphia - - - Greenwich Point; New York, ft. 5th St., Jersey City, N. J.; Baltimore - - - - - Canton Piers
London Agents, Cory Bros. & Co., Ltd., 3 Fenchurch Ave., E. C.

Greene Consolidated Copper Co.
24 Broad Street, New York
WM. C. GREENE, President.
MARK L. SPERRY, Vice-President.
ALFRED ROMER, Treasurer.
GEO. S. ROBBINS, Secretary.
Mines and Works AT Cananea, Sonora, Mexico

GEORGE MITCHELL
PRESIDENT MITCHELL MINING COMPANY
52 Wall Street NEW YORK
522 Bradbury Block LOS ANGELES, CAL.
MINES and WORKS near Acapulco, Guerrero, Mexico.

PHELPS, DODGE & CO.
Selling Agents of the
Copper Queen Consolidated Mining Co., Detroit Copper Mining Co. of Arizona, Moctezuma Mining Co., United Globe Mines.
Electrolytic Copper, Wire Bars, Plates, Ingots and Cathodes, and P. D. Co. Casting Copper.
Cor. Cliff and John Sts. New York

Roland E. Bruner & Co.
Mines and Mining Investments.
Correspondence solicited and promptly honored.
812 Grand Avenue, Kansas City, Mo.

SLIPP-BUTLER COMPANY,
Ore and Metal Selling Agents,
Terms moderate. Correspondence solicited. 81 NEW SREET, NEW YORK.

DEVELOPED MINES AND UNDEVELOPED AND MINING PROPERTIES.
WRITE FOR INFORMATION.
A. HERMAN, 36-37 Spokane & Eastern Building, SPOKANE, WASH.

GRANITE SECURITIES COMPANY,
506, 507, 508, 509 Bradbury Bldg., Los Angeles, Cal.
Underwriters of Corporation Stocks and Bonds. We have a plan that sells Stocks and Bonds

BRITISH COLUMBIA MINING PROPERTY.
I have some promising prospects and want capital for development purposes. Will do business on business lines. Write or call. C. D. RAND, Broker,
450 Granville St., Vancouver, B. C.

RICHARDSON BROTHERS COMPANY

Mexican Mines and Lands

LOS ANGELES, LANKERSHIM BLD'G. NEW YORK, HANOVER BANK BLD'G.

REPRESENTING

BUFA M. M. & S. CO.
TRINIDAD MINING CO.
RICHARDSON CONSTRUCTION CO.

CORRESPONDENCE INVITED

STOCKS BONDS MINING SECURITIES

THE GENERAL SECURITIES CO.

INCORPORATED

We have a developed copper property for sale now netting about $10,000 per month, and two splendid copper prospects. Also a gold property with 5-ft. vein outcropping 6500 feet, 700 feet of workings.

References: Mercantile Agencies. Any Bank of Los Angeles.

THE GENERAL SECURITIES CO., Suite 310 Pacific Electric Bldg., Los Angeles

Tonopah Goldfield Bullfrog STOCKS

Weir Bros. & Co.
[ESTABLISHED 1898]
25 Broad Street, New York
459 Bullitt Bldg., Phila., Pa.

G. H. WALTERS & CO.
EMPIRE STATE BUILDING,
SPOKANE, WASHINGTON.

Gilt edge Mining Investments in legitimate mining properties.

JAMES R. TOWNSEND
PATENTS

428-9 Bradbury Block (Cor. Third and Broadway)
LOS ANGELES, CAL.
U. S. and Foreign Patents, Copyrights, Trade-Marks and Labels. PATENT LITIGATION.

INCORPORATE!

Organization effected in ARIZONA with least trouble and expense. Can begin business day papers reach us. No franchise tax. No public statements required. Stockholders exempt from company liability. Hold meetings, keep books and transact business anywhere. Any kind of stock may be issued and paid up in cash, services or property and made non-assessable. The legislature cannot affect corporate franchises by subsequent laws. Territorial officials now prohibited by law from serving companies. Our president, I. T. Stoddard, was for years Secretary of Arizona and officially in charge of the incorporating business. Write or wire today for copy of laws, blanks and full particulars. By-laws gratis with each incorporation.

Stoddard Incorporating Co.,
Phoenix, Arizona.

Michigan College of Mines

F. W. McNAIR, President

A state institution making use of an active mining district.

For Yearbook and Record of Graduates apply to President or Secretary.

HOUGHTON, MICH.

J. J. Mendez & Co.

Mining and Metallurgical Engineers; Contractors

J. Mendez, Pres. and Treas.
P. A. Bahb, Vice-Pres. & Mgr. T. F. Lee, Sec'y.

Reports, investigations, examinations, etc., on mines, mills, smelters. Equipments and installations prescribed, installed and placed in operation. A complete technical department and efficent force of engineers.

Calle de Gante No. 3, Mexico, D. F.
Codes: A. B. C. 5th Edition, Bedford & McNeill.

An Excellent Opportunity

is offered to all manufacturers of mining machinery to introduce their products in all parts of the world, by the

Permanent International Exhibition at Amsterdam (Holland).

For space and particulars apply to

C. C. ABEL & CO.
118 Broad Street, New York.

THOS. BAKEWELL,
BIG BEND, TEXAS.

Prospector,
Miner, Engineer.

Specialty: Reporting on condition and the finding of lost ore in mines of gold, silver and quicksilver.
At present in quicksilver mines of Western Texas.

Home address: Riverside, Cal.

If you would interest yourself in the very rich—

SILVER-COBALT MINES

of Northern Ontario, perhaps the richest silver deposits in America, or in other Canadian mines, write to

MINES CONTRACT & INVESTIGATION CO., Ltd.
Toronto, Canada.

Correspondence Solicited.

DAN JONES

324 Pine Street, San Francisco, Cal.

Developed and Undeveloped Mines.
Hydraulic and Dredging Propositions.

Nevada Corporation Law

Approved March 16, 1903
For complete information, write
NEVADA AGENCY & TRUST CO.,
RENO, NEVADA.
C. T. Bender, Banker, President.
Geo. F. Turrittin, Banker, Vice-President.
Oscar J. Smith, Banker-Attorney, Secretary and Treasurer.

T. J. SMITH

Financial and Mining Broker.

Gold, Silver, Lead and Copper Mines, also Bituminous Coal Lands and Coast Timber Limits for sale.

Special values in shares of good Coal Company. Correspondence Solicited. Address P.O. Box 439. Office, 611 Hastings St., W., Vancouver, B. C.

ROBISON & LASTINGER,

High Class Mining and Land Investments.
Developed and Undeveloped Mines.
Grazing, Farming and Tropical Lands.

Correspondence Solicited. P. O. Box No. 86.
Oaxaca, State of Oaxaca, Mexico.
1st. Guerrero No. 1.

DIVIDEND

PAYING MINING, OIL TIMBER, SMELTER, AND INDUSTRIAL STOCKS making possible LARGE INTEREST and PROFITS, listed and unlisted, our specialty. Booklets giving full information mailed free on application.

DOUGLAS, LACEY & CO.,
Bankers & Brokers, 66 Broadway, N. Y.

Utah State School of Mines.

Department, University of Utah.

Courses in Mining, Metallurgical, Electrical, Civil, Mechanical, and Chemical Engineering.
Fine ore-dressing, metallurgical, and other laboratories.
Natural advantages unequalled. Expenses low.
Study mining in a mining country.
For further information, address

University of Utah, Salt Lake City, Utah.

Montana State School of Mines

Offers a full four year course in Mining Engineering, with unrivalled opportunities for observing operations in the mines and reduction works that are located near the school.

For catalogues or other information address,

N. R. LEONARD, President, Butte, Montana.

Locations for Industries

ON

THE ERIE, THE COMMERCIAL RAILROAD

New York to Chicago

The Erie Railroad System's Industrial Department has all the territory traversed by the railroad districted in relation to resources, markets and advantages for manufacturing, and can advise with manufacturers in relation to the most suitable locations. For full information address

LUIS JACKSON

Industrial Commissioner, Erie Railroad Company

21 Cortlandt Street, New York

Thro' Ute Pass

The line to Manitou, Cascade, Green Mountain Falls, Manitou Park, Cripple Creek, Buena Vista, Leadville, Aspen, Glenwood, New Castle, Grand Junction, Salt Lake, Ogden and the West.

PULLMAN SLEEPING CAR
AND
RECLINING CHAIR CARS
ON THRO' TRAINS
SHORTEST AND BEST ROUTE

Colorado Midland Railway Co.

GENERAL OFFICES: DENVER, COLO.

GEO. W. VALLERY, Gen'l Mgr. — O. H. SPEERS, Gen'l Pass. Agt.

THE DETROIT LUBRICATORS

Are Standard the world over.
More than 850,000 of them are in use.

Catalogue on Application.

Look for the genuine Original Package.

Detroit Lubricator Co., Detroit, Mich.

CONCENTRATED POWER

NORTHERN Electric Power is Concentrated—a larger proportion of the engine energy reaches the driven machines—no matter how remote from the power plant—than any other type of power.

Northern Electric Power can be concentrated, when need be, at any point, as for instance, when the mine is flooded, and the pumping plant is overloaded. At such times the entire power plant can be concentrated at the pumps, to unwater the property in quickest possible time.

Northern Machines have proven their superiority in actual, daily, severe mining service. They can be relied on at all times—and in emergencies prove themselves equal to the hardest tasks.

Leaflet No. 125-B-6 is of interest to mine operators with pumping propositions.

NORTHERN ELECTRICAL MFG. CO.

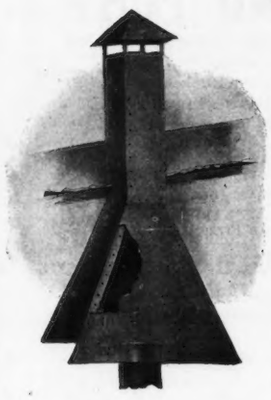
Engineers - Manufacturers

MADISON, WIS., U. S. A. 695

BUYERS' DIRECTORY.

Alphabetical Index to Advertisers, Pages 44 to 47.

	PAGE
Air Compressors	5, 8, 9, 13, 63, 66, 70, 71
Alloys	2, 61
Amalgam Plates	4
Asbestos	61
Assayers	57
Assayers' and Chemists' Supplies	29, 34, 76, 77
Attorneys at Law	84
Balances, Assayers'	1, 34, 76, 77
Ball Mills Liner, Plates and Bal s	5, 44
Barrows	
Bearings, Ball	75
Belting	48, 78
Belt Lacing Steel	84
Blowers	4, 28, 68
Boilers	68
Boiler Compounds	24, 48
Boiler Equipment	24
Boots, Waterproof	
Box Car Loaders	
Brick Machinery	33 71
Briquetting Machines	10
Brokers (Mining Lands and Stocks)	58, 59
Buckets, Automatic	5, 6, 78
Buckets, Elevator	6, 78
Cableways, Suspension	19, 32, 33, 67
Cam Shafts for Stamp Mills	25
Candles, Miners'	
Candlesticks, Miners'	63
Caps	81
Carbons	72, 79
Car, Hauls	7, 26, 33, 66, 67
Cars (Dump, Mine and Ore)	5, 28, 27, 33, 66, 67
Castings	5, 68
Chain Blocks	48
Channeling Machines	9, 13
Chemicals	39, 61, 81
Chemists	39
Chrome Ores	61
Chrome Steel Castings and Forgings	68
Classifiers, Mechanical	68
Clutch Friction	5, 71
Clutch, Magnetic	71
Coal and Coke Producers and Dealers	58, 59
Coal Cutters	7, 9, 13
Coal and Ore Handling Machines	5, 6 7, 9, 13, 69
Coal Mining and Washing Machinery	9, 13, 15, 63, 74
Coke Ovens	
Colleges, Engineering	59, 66
Concentrators	5, 15, 16, 22
Conveyors	5, 6, 19, 83
Copper Convertors	4, 5, 6
Copper Furnaces	5, 8
Copper Producers and Dealers	58
Crane Motors	60
Cranes	5
Crucible Graphite, etc	58, 74
Crucible Steel Castings	68
Crusher Rings, Steel	68
Crushers	3, 4, 5, 6, 10, 14, 15, 24, 26, 32, 64, 84
Cupels	32
Cyanide	39, 72, 83
Cyanide Plants	2, 82
Cyanide Vat Excavators, etc	
Drafting and Engineers' Materials	76, 77
Dredging Machinery	4, 5, 28, 68, 69, 78
Drills	7, 8, 12, 13, 47, 73, 75
Drill Sharpeners	14, 75, 84
Drill Steel	12, 73
Drills, Air	11, 12, 13, 71, 73, 75
Drills, Core	9, 13, 73, 75
Drills, Hand	13, 73, 75
Drills, Rock	7, 9, 11 12, 13, 73, 75
Dryers, Mechanical	79
Electric Rock Drills	9
Electrical Machinery	45, 46, 60, 66
Electrical Instruments	84
Electrodes	65
Emery Grinders	58
Engine Couplers	
Engineers	5, 50
Engineers' Instruments	76, 77
Engines, Steam	4, 5, 28, 48, 64
Engines, Traction	
Exhaust Heads	28
Explosives	4, 65, 70
Fan Motors	45
Fans (Mine Ventilating)	28, 31, 45, 69
Feed Water Purifiers	
Filters	68
Flint Pebbles	
Fluorspar	
Filter Presses	68
Fire Brick and Clay	2, 3 47, 71
Fittings, Cast Iron	
Foundry Equipment	33
Forges	28
Forgings	68
Fuel Economizers	28, 61
Furnaces Assay	30
Furnaces, Copper	4, 5, 17
Furnaces, Roasting	3, 4, 5 10, 30
Furnaces, Smelting	3, 4, 5, 8, 33
Fuse	70
Fuse Cutters	81
Gas and Gasolene Engines	6, 27, 42
Gas Producers	5, 49
Gauges, Valve	84
Gears	81
Gearing	6, 43
Generating Sets	28, 45, 46



"TRANSITE"

(Asbestos)

Fire-Proof Smoke Jacks

Made from "Transite" Asbestos Lumber, an exceedingly durable and fire-proof material that resists the action of fire, gases and acids. These Smoke Jacks are preferable to those made of wood, because of their durability and heat resisting properties. Absolutely fire-proof and not subject to contraction or expansion. Do not permit the collection of condensation.

Write nearest branch for "Transite" Catalog

H. W. Johns-Manville Co.

Manufacturers of Asbestos and Magnesia Products, Electrical Insulating Materials, "Noark" Fuse Devices, Electrical Railway Supplies, Etc.

New York Milwaukee Chicago Boston Philadelphia St. Louis Pittsburg Cleveland New Orleans Kansas City Minneapolis Little Rock San Francisco Los Angeles Seattle London 176

THE SOLVAY PROCESS COMPANY

TRADE MARK

SYRACUSE, N. Y.

AND

DETROIT, MICH.

TRADE MARK

MANUFACTURERS OF

SODA ASH in all commercial tests

CAUSTIC SODA in all tests

MONO-HYDRATE CRYSTALS 1 lb.—2 1-2 lbs. Sal Soda

SNOW-FLAKE CRYSTALS 1 lb.—2 lbs. Sal Soda

SOLE AGENTS:

WING & EVANS, Inc. 22 WILLIAM ST. NEW YORK.

CABLE ADDRESS "OMEC"

Occidental

MACHINERY & ENGINEERING CO.,

(INCORPORATED)

MAIN OFFICE 401 MISSION STREET, SAN FRANCISCO.

WE FURNISH MACHINERY OF ALL KINDS. WE ERECT AND INSTALL MACHINERY. OUR SPECIALTY IS COMPLETE PLANTS

Branches at Los Angeles, Cal. Portland, Ore., Seattle, Wash. Bellingham, Wash.

TRADE MARK

LION BRAND ALLOYS & METALS

FOUNDED 1838 BY GEO. G. BLACKWELL

Ferro Alloys, Metals and Ores.

FERRO-PHOSPHORUS. CARBONLESS CHROMIUM METAL.
FERRO-MOLYBDENUM. Pure Pulverized MOLYBDENITE.
FERRO-CHROME. 60-72% Cr. 4% to 11% Carbon and any grade to 10%.
FERRO-TUNGSTEN. 70-80% TUNGSTEN METAL. Powder.
FERRO-TITANIUM. FERRO-SILICON. FERRO-VANADIUM. 25% and 50%.
FERRO-SILICON. 22% 50% and 75%. COPPER SILICON.
S.A.M. ALLOY. Produces sound ingots and castings free from Cavities.
CHROME ORE. Blackwell's special Refractory quality for Furnace Linings.
MANGANESE ORE in every Form.
FLUOR SPAR. We are the largest users thereof in the World.
PLUMBAGO. BLACKLEAD. METAL WORKERS' CRAYONS.

We make any and every ALLOY AND METAL required.
We make a SPECIAL HIGH SPEED ALLOY FOR TOOL STEEL.

GEO. G. BLACKWELL, SONS & CO., LIMITED, THE ALBANY, LIVERPOOL, ENG.

Manufacturers, Metallurgists, Mine Owners, Merchants.

WORKS: Garston Docks. CODES: A.B.C., Mooring & Neal, Lieber's, & Western Union.

Agents in the U.S.A. for our FLUOR SPAR—The Pittsburgh Plate Glass Co., Pittsburgh, Pa.
CHROME ORE—The Pittsburgh Water Co., Pittsburgh, Pa.

We Manufacture

PERFORATED METALS

of every description and for every purpose

Our new catalogue will be sent free upon request

HENDRICK MANUFACTURING CO., Carbondale, Pa.

New York Office, 149 Broadway.

Ask for THE GREEN PLANING MILL EXHAUSTER CATALOG.

If you have wool, shavings, bark, chips, hair, emery, dust, straw, sawdust or other light materials to handle in your factory or shop you want a copy of our planing-mill exhauster booklet just issued.

It describes the new *Cone Blast Wheel*, which is a great improvement on the old style of planing-mill wheel. It has no corners, angles nor crevices in which fibrous materials can catch and clog. Everything that enters the inlet is bound to pass out through the discharge

The Cone at the back of this wheel gradually turns the entering current of air towards the discharge without power-consuming shock and eddies. This is important in a planing-mill exhauster, as the air must have a high entering velocity in order to carry solids in suspension. The cone back of the wheel also serves to deflect heavy pieces of bark or chips.

This cone back permits the inner bearing to be set in close to the center of gravity of the wheel, which reduces overhang and, therefore, wear and pressure. The bearings are ring oiled and the oiling can be inspected at any time.

These wheels are heavily and strongly built, the plates are extra heavy, the floats are attached to the cone by angle iron strips and the balancing is perfect. The housings are likewise made of heavy material and, where other makers space the bolts 5 in. on centers, we put them in every 2½ in.

As stated, this is a new style of fan, but we have already sold large numbers which have been thoroughly tested out. *Ask us for names and addresses of users.*

Besides planing-mill exhausters, we make fans, blowers and exhausters for all purposes, heating coils for steam and hot water heating, dry kilns, etc.

Ask for BOOK "103 EM."

THE GREEN FUEL ECONOMIZER CO.,

GEO. W. GIBSON PARK ROW NEW YORK

Matteawan, N. Y.

(Sole builders of the Green Fuel Economizer in the United States.)

MINING SCREENS

The Harrington & King Perforating Co.

PERFORATED METALS

OF EVERY DESCRIPTION. FOR ALL PURPOSES AND FOR SCREENS OF ALL KINDS

CHICAGO U.S.A.

241 NORTH UNION ST. CHICAGO

114 LIBERTY ST. NEW YORK

MAIN OFFICE & WORKS CHICAGO

OF HIGHEST EFFICIENCY

FRENIER'S

SAND PUMP

For Elevating Tailings, Slimes, Battery Sands to Jigs, Etc.

No Valves No Buckets

Circulars Free

AGENTS

ALLIS-CHALMERS CO., Chicago, Ill.

STEARNS-ROGERS MFG. CO., Denver, Col.

HARRON, RICKARD & McCONE, San Francisco, Calif.

FRENIER & SON, Rutland, Vt.

MINING MACHINERY

of every description. Crushers and Rolls, Crosshead Lift Pumps, Steam Hoisters, Complete Concentrating Pumping Plants, Mathey Improved Heater, Etc. Get estimates.

GALENA IRON WORKS CO., Galena, Ill., and Platteville, Wis.

ARE YOU INTERESTED IN ORE SEPARATION

PERHAPS WE HAVE THE MACHINE YOU NEED

MAGNETIC SEPARATORS

SAMPLES TESTED FREE

SEND FOR PARTICULARS

DINGS ELECTRO-MAGNETIC SEPARATOR CO.

MILWAUKEE, WIS.

PLATINUM

Resistance Wires to Specifications. Protective Fuses for Small Currents. Ignition Fuses for Torpedo and Mining Operations. Special Forms for Wire esa Telegraphy. All Forms of Electrical Contacts.

BAKER & COMPANY, INC., 408-414 N. J. R. R. Avenue, NEWARK, N. J.

C. O. Baker, Pres. New York Office: 120 Liberty St. C. W. Baker, Vice-Pres.

IS WATER SCARCE

at your mine? The Blake-Morscher Electrical Ore Separator requires none and can profitably handle your ores, especially if they contain zinc, iron, lead, copper, molybdenite, graphite, etc.

Write for full information.

THE BLAKE MINING & MILLING CO.,

1936 Curtis St.,

DENVER, COLORADO.

START RIGHT If you are convinced of the value of an Injector begin with the best—the U.S. AUTOMATIC INJECTOR.

GET RIGHT If you have had any trouble with your Injector—make the change now—get the right one—the U.S. AUTOMATIC INJECTOR.

KEEP RIGHT Those who have had experience with the U. S. AUTOMATIC INJECTOR know it is all right in every way—hence they keep it in use.

OVER 200,000 ENGINEERS AND THE U. S. GOVERNMENT ENDORSE THROUGH DAILY USE THE

U. S. AUTOMATIC INJECTOR

It is a fuel saver—supplies feed water to the boiler at almost boiling point. It has an efficiency of almost 100 per cent. Because it returns all the steam back to the boiler and also all the heat less the slight amount lost by radiation. Most efficient, economical and reliable. Simple to operate—turn on the steam to start, turn off the steam to stop.

Get a copy of our "Engineers' Red Book"—the worth while book of information on the Injector question. Free for the asking.

AMERICAN INJECTOR CO.,

DETROIT, MICHIGAN, U. S. A.

The Carter Auto-Magnetic Ore Separator

Absolutely Non-Electric

Requires no artificial power whatever. First cost whole cost. No moving parts, no friction or wear. Adaptable for any material where there is an admixture of iron.

Can be seen in operation at

THE CARTER AUTO-MAGNETIC ORE SEPARATOR CO.

Telephone 329 Cortlandt 123 Liberty St. NEW YORK

SEND FOR OUR CATALOGUE

MAGNETIC SEPARATORS

The only successful method for the elimination of iron from zinc and copper ores.

Catalog "E" tells all about it. Ask for same.

United Iron Works Co.

Springfield, Mo.

BUYERS' DIRECTORY.

(*Continued from Page 60.*)

Alphabetical Index to Advertisers, Pages 44 to 47.

	PAGE
Generators	4, 45, 46, 58
Governors, Water-wheel	79
Graphite	69, 74
Grease	48
Grease Cups	84
Grinding Mill Machinery, 3, 4, 5, 6, 8, 9, 10, 14, 15, 17, 20, 26, 29,	30
Harness	81
Head Protectors	42, 61
Heaters	
Hoisting Engines..4, 5, 6, 8, 9, 17, 21, 22, 31, 32, 44, 62,	84
Hose, Steam and Water	21
Hose, Steel Armored	21
Hydraulic Rams	53
Injectors	2, 62, 84
Jaw Plates	29
Jigs	1, 27, 30
Lamps, Miners'	71
Lathes	
Lead, Pig	39, 82
Lead, Assayers' Testing	34
Link Belting	68
Locomotives	7, 21, 28, 68
Locomotives, Electric	7, 21
Lubricators, Sight Feed	60
Manganese Steel	29, 66
Metal Dealers	4, 5, 39, 82
Mills, Mixing	4
Mine Cage Chairs	5
Mine Doors	
Mineral Collections	18
Mining and Land Companies	58, 59
Mining Machinery....3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 33, 46, 60, 67, 71, 72, 81,	83
Mortars	
Motors	45, 60, 66
Nickel Steel	45
Oil Burners	32
Oil Cups	84
Oil Pumps	84
Oil Water Purifiers	
Oil Well Supplies	
Ore Feeders	3, 5, 22
Ore Purchasers	39, 82
Ore Screens	5 14, 20, 22
Ore Testing Works	82
Packing and Pipe Coverings	64
Packings Rod	2, 64
Paints	83, 74
Perforated Metals	61, 62
Phosphor-Bronze	
Pick Machines	9
Pig Iron	82
Pipe	79, 80, 81
Pipe Bending Machinery (Hand)	65, 71
Pipe Threading and Cutting Machines	
Pipe Wrenches	
Platinum	62
Platinum Wire Sheet and Ware	
Portable Houses	71
Pulleys	48
Pumps	13, 25, 27, 31, 62, 63, 70, 71, 77
Railroad Supplies and Equipments	33, 67, 69
Rare Minerals	18
Rolls, Crushing	3, 8, 14, 24
Roll Shells	29, 68
Roofing	
Rules, Steel	76, 83
Screens, Mining	14, 20, 22, 27, 62
Second-hand Machinery	40, 41, 42
Separators, Electrical	62, 69, 71
Separators, Magnetic	15, 62, 69, 71, 79
Shoes and Dies for Stamp Mills	3, 25, 68
Shovels, Steam	28, 69, 78
Silex Lining	17
Smelting and Refining Works	39, 81
Squibs	
Stamp Mills,	3, 4, 5, 6, 8, 9, 10, 11, 25, 29, 66
Stamp Mill Wearing Parts	68
Steam Specialties	6, 18, 60, 70
Stop Cocks	84
Structural Steel	2, 23, 62, 67, 68, 69, 75
Switches	33, 67
Tanks	2, 81
Telephone, Mine	31
Time Checks	48
Tools, Pneumatic	71
Tramways, Wire Rope	19, 33, 67
Tube Mills	4, 5, 8, 17, 62
Turbines	4, 5, 79, 80
Valves	84
Valves, Pump	84
Washers for Coal	9, 60
Water Columns	5
Water Gates	68
Water Skips	5, 19
Water Softeners	
Water Wheels	5, 22, 79
Well Drilling Machinery	75
Wire Cloth	62, 63
Wire, Wire Rope and Cables	19, 33, 67
Zinc Ores	

Aldrich Electric Pumps.

Vertical Triplex Sinking Pump.

Arranged with Drip Protected Motor. Large valve area, admitting of high speed in case of need. Of superior construction throughout. Highest efficiency of pump and motor. Built in 6 sizes, capacities of from 50 to 300 gallons per minute and maximum lift of 300. Get our valuable Pump Data. Sent free.

The Allentown Rolling Mills,
Allentown, Pa., U.S.A.

"The Perfect" Double Crimped
Mining Screens
Ludlow-Saylor Wire Co., St. Louis, Mo.
Agents: Mine & Smelter Supply Co., Denver, Salt Lake City, El Paso.

YORK BRIDGE CO.
YORK, PA.
STRUCTURAL WORK, BRIDGES

SAFETY LAMPS
ASHWORTH--HEPPLEWHITE--GRAY
MADE BY
AMERICAN SAFETY LAMP AND MINE SUPPLY CO., SCRANTON, PA., U. S. A.

ALL KINDS OF IMPROVED
MINING MACHINERY
RIEDLER PUMPS and COMPRESSORS
KORTING GAS ENGINES
CORLISS STEAM ENGINES
BLOWING ENGINES with Gutermuth Patent Valves
TUBE MILLS
Agents in South Africa for
HADFIELD'S "ERA" MANGANESE STEEL
Roasting and Smelting Furnaces, Robins Belt Conveyors for Coal and Rock, Coal Washing Machinery, Rateau Steam Turbines.
FRASER & CHALMERS, Ltd.
Works at Erith, Kent, England. Head Offices, 3 London Wall Bldgs., London, E. C.
Cable Address: Vanner, London.
BRANCH OFFICES:
Johannesburg, Bulawayo, Salisbury, South Africa; Sekondi, West Africa; Kalgoorlie, W. Australia
Sole Agent for Canada: W. H. C. Mussen & Co., Cor. Victoria Sq. and St. James St., Montreal

NORDBERG

Air Compressors. Gas Compressors. Blowing Engines.

If steam economy is of any moment, you cannot afford to consider ny other than a Nordberg Compressor.

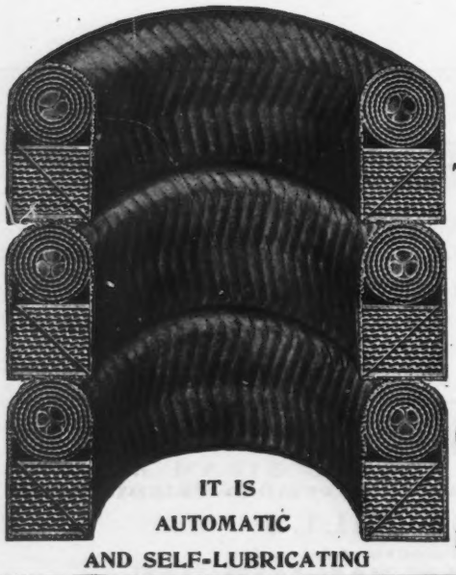
On page 3 of our Compressor Catalog we state, "We stand ready to guarantee a higher economy of fuel in compressing air than any other builders of Air Compressors in the World."

We know our machinery and mean just what we say. Our guarantee is clear and we do not hesitate to back it with cash forfeitures.

Have you informed yourself as to the Nordberg Variable Capacity Compressors.

NORDBERG MFG. CO., Milwaukee, Wis.

Self-Adjusting Diagonal Rod Packing Rings



IT IS AUTOMATIC AND SELF-LUBRICATING

are, of course, the best, as only a slight pressure on the gland causes the diagonal wedge to slide and produce a steam-tight rod.

The "BELMONT"

is the best of this type, as it will not score the rod, nor crumble, and will last 2 or 3 times longer than others. Booklet "B" gives instructive information about packing. Do you want it?

Clement Restein & Company

Philadelphia, Pa., U. S. A.

The Engelbach Laboratory Crusher

Exceeding useful in the laboratory and assay office. Can be operated either by hand or belt power, will crush very fine with minimum power. Opening 2½ x 4 inches.

Write for Circulars and Prices.

The Engelbach Sample Grinder

Recognized the best Ore Sample Grinder made. Hundreds in use in all leading Smelters, Sampling and Metallurgical Works. Compact, durable and easy to operate, grinding surfaces 12 inches.

ENGELBACH-REYNOLDS MCH. CO.

14th and Blake Streets, Denver, Colo.

12 H. P.

This is one of the many sizes and styles we keep in stock.

The Superior Points of Freeman Geared Hoisters

are: gear and pinion cut from the solid; extra outboard bearing on crankshaft preventing vibration; rod and crankshaft of steel billet, carefully machined; large crank pin and bearings; oil reservoir in drum hub; heavy bed plate cast in one piece.

Send for "Bulletin No. 100"—it gives the details.

We build High Grade Mining Machinery of all kinds.

Stock on hand ready for delivery.

FREEMAN FOUNDRY & MFG. CO.,

Joplin, Missouri.

A New Blasting Battery

Heretofore the largest battery made has fired about 50 shots, in actual practice. We know you've been waiting for one that would beat that, and we now have it.

This new battery at at the factory test fired 180 shots; probably it would not do this right along on account of leakage in the current, etc., but it will fire 100 shots easily. Write us about it.

The Aetna Powder Co.

143 Dearborn Street, Chicago, Ill.

If You Accidentally Drop a Pick into a Case of Ordinary Blasting Powder

the chances are there would be an explosion and many unpleasant things would happen. But if it was **Nitro Powder**, nothing could happen, because Nitro Powder contains only one-half the quantity of nitro-glycerine that any other powder contains. Will not freeze above 35° F. and does not throw off great quantities of noxious fumes as other powders. Ideal mining and tunnel dynamite. Send for full particulars and prices.

Nitro Powder Company

KINGSTON, N. Y.

DuPont Explosives

Dynamite *Fumeless Gelatine*

FOR TUNNEL WORK

Blasting Powder.

Smokeless & Black Powder
For all Kinds of Guns.

MAKERS OF THE CELEBRATED

DuPont Smokeless.

E. I. DuPont Company

BRANCH OFFICES:

New York, N. Y., 170 Broadway. St. Louis, Mo., 608 Commercial Bldg.
Philadelphia, Pa., Harrison Building. Denver, Colo., Opera House Block.
Pittsburgh, Pa., 525 Farmers Bank Bldg Chicago, Ill., Masonic Temple.
Birmingham, Ala., First National Bank Bldg. Huntington, W. Va.
Cincinnati, O., 907 Union Trust Bldg. Omaha, Neb., 1214 Harney Street.

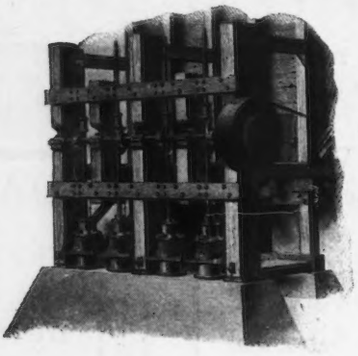
We Make a Full Line of
MINE CARS.
Write Us Your Wants for Our Quotations.

The Cleveland Car Co.,
Cleveland, - - - - Ohio.

NO. 521 ONE-SIDE DUMP CAR.

THE NISSEN STAMP

An Individual Circular Motion Gravity Stamp



Half the Power.

Fewer Slimes.

More Uniform Product.

Greater Capacity per Horse Power.

FIGURE IT UP YOURSELF:—
How much will you increase your savings of values in your ore by decreasing the slimes?
How much fuel expense will you save per month?
Write us for catalog No. 640 N.

Fairbanks, Morse & Co.,
Main Office, Chicago, Ill.

New York, N. Y.
St. Louis, Mo.
St. Paul, Minn.
Denver, Colo.
Los Angeles, Cal.
San Francisco, Cal.
Salt Lake City, U.
Portland, Ore.
Spokane, Wash.
Seattle, Wash.

DON'T PASS THIS BY.

Your mine may be about ripe for a dust explosion. Head it off **now;** write us and we'll tell you how the

Rockwood Mine Water Car

will clear every part of your mine—floor, sides, roof and gob—of dangerous dust, with the least quantity of water necessary. Don't wait until **after** the explosion. Act **now.** The information costs nothing, the car not very much, but the **explosion** a **great deal.**

S. B. STINE & SON,
Sole Licensed Manufacturers
Osceola Mills, Pa.

A VERY VALUABLE ADDITION

to an Armstrong Die Stock.

The Bard Adjustable Bushing gives you any sized bushing you need with a simple twist of the cam plate. Saves all the bother of changing bushings in the stock, all the trouble from lost bushings and brings the pipe to perfect centre always.

A strong, well-made device that can't get out of order.

Fits the Genuine Amstrong Die Stocks.

Write for our complete catalog and prices.

THE ARMSTRONG MANUFACTURING CO.
286 KNOWLTON STREET, BRIDGEPORT, CONNECTICUT.

MOTORS

Alternating } Current
Direct }

Commercial Electric Co.
Indianapolis, Ind., U.S.A.

MANGANESE STEEL CASTINGS

FOR ALL KINDS OF

MINING, MILLING AND DREDGING MACHINERY

WE GUARANTEE OUR CASTINGS TO BE EQUAL TO "THE BEST"

AMERICAN BRAKE SHOE AND FOUNDRY COMPANY,
CHICAGO HEIGHTS, ILLINOIS.

ROSE POLYTECHNIC INSTITUTE
Terre Haute, Ind. A College of Engineering Mechanical, Electrical, and Civil Engineering, Chemistry and Architecture. Extensive shops. Laboratory equipment. modern. Expenses low. For Catalog and Professional Register of Alumni, address C. L. MEES, Pres.

AIR COMPRESSORS CATALOGUE GRATIS
AMERICAN AIR COMPRESSOR WORKS
No. 26 CORTLANDT ST., NEW YORK

Established 1848

HAZARD STANDARD WIRE ROPES

SWEDES IRON

CAST STEEL

GALVANIZED IRON AND STEEL

PLOUGH STEEL

TRADE MARK

Special Ropes for All Purposes

HAZARD MANUFACTURING COMPANY

71-73 West Adams Street, CHICAGO. 50 Dey Street, NEW YORK

GENERAL OFFICE AND WORKS: WILKES-BARRE, PA.

Aerial Wire Rope

TRAMWAYS and WIRE ROPE.

Temporary Office:

1009 WASHINGTON STREET,

Oakland, Calif.

HALLIDIE-PAINTER TRAMWAY CO.

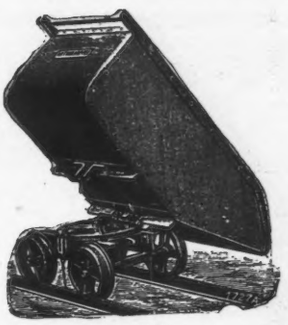
ROEBLING

WIRE ROPE

MADE BY

John A. Roebling's Sons Co.

TRENTON, NEW JERSEY.



New Location For Your Plant

On both rail and water-ways and near coal mines

there are many good factory locations available today. The Burlington Route has located many factories and they are all successful. Do YOU want our assistance? If so, write.

Burlington Route

W. H. MANSS
Industrial Commissioner
209 Adams St.
1934 CHICAGO

Frogs and Switches

ALSO

Crossings, Stands, Rails and all Track Accessories for Rail from 8 to 100 lbs. per yard

We design your layouts and make no charge for consulting engineering.

ADDRESS

The Indianapolis Switch & Frog Company

Springfield Ohio.

CYANIDE

"Beckton Brand"

Made by

The Gas Light & Coke Co.

London - - England

Sole U. S. Agents

National Aniline & Chemical Co.

100 William St., New York.

ARTHUR KOPPEL INDUSTRIAL RAILWAY COMPANY EQUIPMENTS

Manufacturers of

Mine & Ore Cars

(OF DIFFERENT TYPES)

also

Rails Switches
Steel Ties Frogs
Portable Turntables
Track Skips

Etc., Etc.

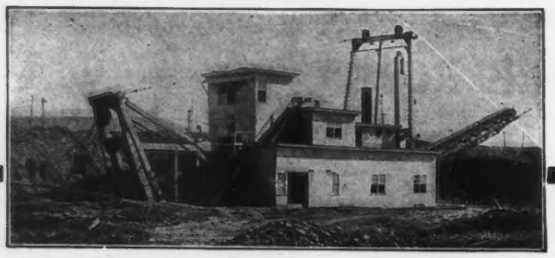
OUR LARGE STOCK

Insures Prompt Shipment.

Write for Catalogue No. 19.

DEPT E.

66-68 BROAD ST., NEW YORK.
618 MONADNOCK BLK., CHICAGO.



GOLD DREDGES

AND PLACER MINING MACHINERY

designed and built to insure minimum loss of time for repairs and renewals, rather than low first cost.

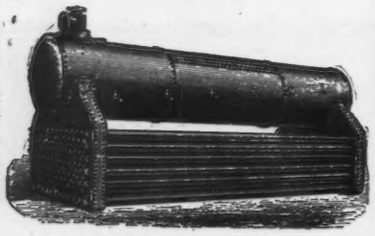
THE LINK-BELT MACHINERY CO.
CHICAGO

MORAVA CONSTRUCTION COMPANY
MANUFACTURERS
STRUCTURAL STEEL
See larger ad. first issue each month.
CHICAGO, ILL.

J. L. WHITNEY & CO., 3 & 4 Ziegler Blk., Spokane, Wash.
DIVIDEND PAYING MINES.
We make a specialty of Coeur d' Alene, Idaho, stocks that are paying dividends. Also in properties that promise to soon join the shipping list.

BLOWERS
FOR SMELTER WORK
The Connersville Blower Co.
Connersville, Indiana, U.S.A.

Heine Boilers



Are built entirely of flange steel plates. No cast parts

Unsurpassed for Metallurgical Plants

Manufactured only by the
HEINE SAFETY BOILER COMPANY.
421 Olive St., St. Louis, Mo.

CRUCIBLES

for melting brass, steel and ores of all kinds. Special work for Chemical purposes. Fine plumbago always on hand. We have the best equipped crucible plant in the world.

Ross-Tacony Crucible Co.
Tacony, Phila., Penn.

327 EAST 56TH ST
SHRIVER FILTER PRESSES
NEW YORK CITY

STEEL CASTINGS

Mining Machinery
Hydraulic Rams

Columbia Engineering Works
PORTLAND, OREGON. U. S. A.

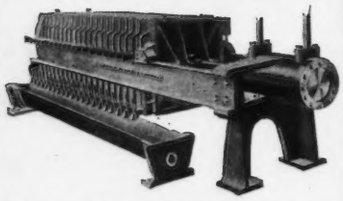
CHROME STEEL WORKS
CHROME, N. J., U.S.A.

Shoes and Dies

For Stamp Mills, Canda Self Locking Cams, Tappets, Bossheads, Cam Shafts, Stamp Stems.

Send for Illustrated Pamphlet.

MINING
FILTER
PRESSES

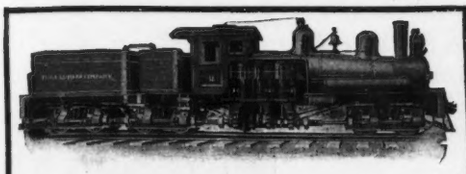


WILLIAM R. PERRIN & COMPANY
Chicago, U.S.A. Toronto, Canada

Wilson Shoes & Dies

We guarantee WILSON shoes and dies to be far superior to any made from molten metal poured into moulds, and to be free from blow holes and porous places or soft spots. They never chip off or break.

Western Forge Company
St. Louis, Mo., U.S.A.



LOCOMOTIVE BUILDING

has been our business for over thirty years, until the High Quality of LIMA LOCOMOTIVES is known the world over. We make them for Mining, Quarrying and Logging Operations; for Contracting, Constructing and Railroad Work.

Our Light Direct-Connected Locomotives

are the most practical Engines yet constructed for Mining and Logging Operations.

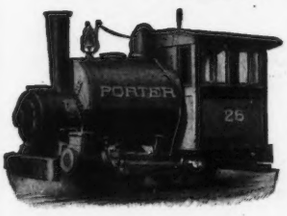
Built for any practicable gauge Write today for Catalog No. 14.

The Lima Locomotive & Machine Company,

121 East Second St., LIMA, O., U. S. A.

LIGHT LOCOMOTIVES

STEAM AND COMPRESSED AIR



3 to 50 Tons Weight—Narrow and Wide Gauges

Illustrated Catalogue mailed on application of intending purchaser, or to accommodate others on receipt of 50 cents in stamps.

Locomotives, 36 and 56½-inch gauge, on hand.

H. K. Porter Company

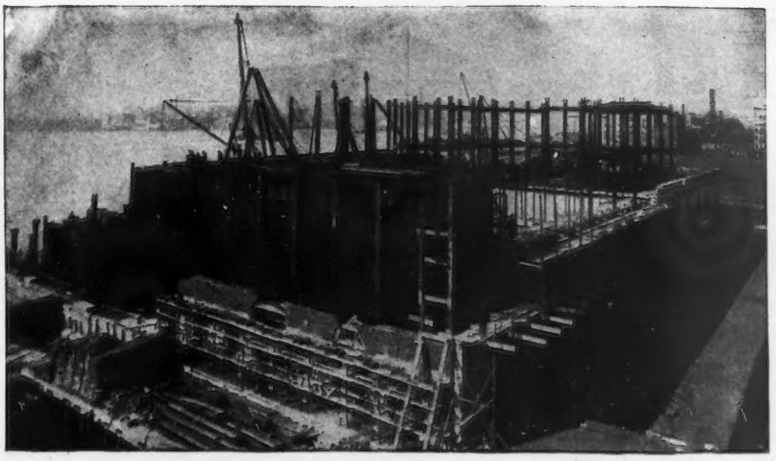
"Contractors." **555 Wood Street, Pittsburg, Pa.**

A NEW SEPARATOR. See our large advertisement in the first and third issues of the month.

NEWAYGO PORTLAND CEMENT CO., - - NEWAYGO, MICH.

WEBSTER M'F'G CO.

We install and furnish
COAL HANDLING MACHINERY
LOCOMOTIVE COALING STATIONS
COMPLETE ASH HANDLING PLANTS



800 Ton Suspension Coal Bunker in course of construction.
Designed and erected by Webster Mfg. Co.

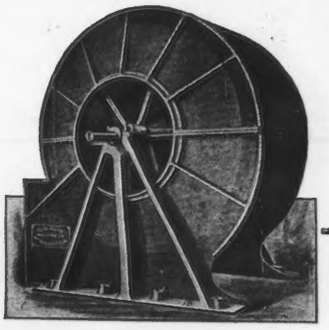
Eastern Branches
88-90 Reade St., New York
1209 Penna. Bldg, Philadelphia
Empire Bldg, Pittsburg, Pa.

OFFICE AND WORKS
1075-1111 WEST 15TH ST.
CHICAGO

SWITCHES, FROGS, CROSSINGS, RAILS.

We manufacture and carry in stock switches, frogs, switch stands, portable track made of all sections of rails. Write for catalogue "A." We always carry in stock 12, 16 and 20 lb. rails and fastenings for Tramway purposes.

M. MITSHKUN CO., DETROIT, MICH.



The Robinson Ventilators

are designed and built with the same care and accuracy as the best of Corliss engines. That is why they give such high efficiency. We have more to tell you. Send for the catalog.

Robinson Machine Co.,
Pittsburg, Pa., U. S. A.

ACHESON TRADE ELECTRIC FURNACE MARK GRAPHITE

Acheson Graphite Electrodes

Especially adapted for use in the electrolytic extraction of gold from its ores in cyanide solutions.

Acheson Graphite Paint

The ideal protective coating for mine pumps, boilers, stacks, and all structural iron and steel. Write us for our pamphlet "Protection, Resistance and Durability."

International Acheson Graphite Co.
Niagara Falls, N. Y., U. S. A.

The Bucyrus Co.
South Milwaukee, Wisconsin

STEAM SHOVELS and DREDGES

DO YOU BLAST?

If so write us, as we have for 20 years been saving money for people in your line by selling the best **Batteries** and **Exploders** on the market at prices no higher than others.

MACBETH FUZE WORKS

Manufacturers

Pompton Lakes, New Jersey, U.S.A.

Send Your Orders to Headquarters for Electric Fuzes, Batteries, Fuse and Caps.

Send for Catalogue

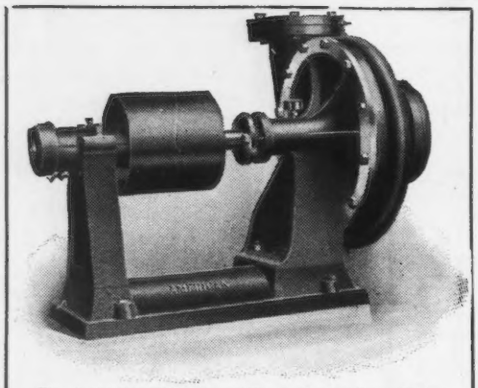


Fig. A Horizontal Centrifugal Pump, Suction Force Type.

THE AMERICAN CENTRIFUGAL PUMP

of high mechanical efficiency and sold at a moderate price. Send for our complete catalog No. 5-B and let us show you just what can be done in the way of pumping large volumes of water with an extremely simple, small and inexpensive machine. We also build

AIR COMPRESSORS, ALL STYLES AND SIZES.
ARTESIAN WELL PUMPING MACHINERY.

All our machinery is built on entirely new lines under a positive guarantee of mechanical efficiency.

The American Well Works, Aurora, Ill.

First National Bank Building, Chicago, Ill. Joplin, Mo. New York, 2-4 Stone St. Dallas, Texas. Denver, Colo., Morse Bros. Machine and Supply Co. Oakland, Cal., California Hydraulic Engineer Supply Co., 7th and Market Sts.

SMOOTH-ON COATED CORRUGATED IRON GASKET
These Gaskets will stand more pressure than any steam gauge shows or any steam pipe will resist
Smooth-On Manufacturing Company, Jersey City, U.S.A.

Why not use a gasket that will last as long as the rest of the joint?

A gasket that has resiliency to take up any spread of the flange caused by the expansion and contraction of the pipes.

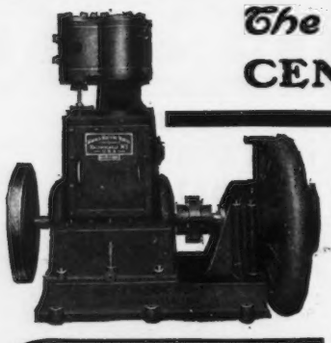
The best and cheapest Gasket for flanged joints for any pressure or temperature. Especially valuable for superheated steam—

Joints taken apart and gasket used again.

Send for Illustrated Catalog.

SMOOTH-ON MANUFACTURING COMPANY,
JERSEY CITY, U. S. A.

The MORRIS CENTRIFUGAL



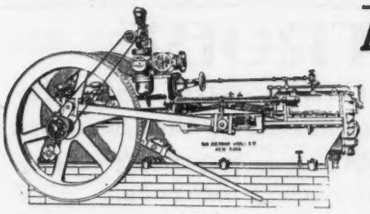
Side-Suction Type

With direct connected high-speed enclosed engine running in an oil bath. A highly efficient pump for general use. Very strong and durable. Send for catalogue. We build every style, size and type of Centrifugal Pump and our customers secure the results of our 42 years' experience covering every pumping problem.

Morris Machine Works

Baldwinsville, N. Y., U. S. A.

Established 1864.



Air Compressors

ALL STYLES—ALL SIZES

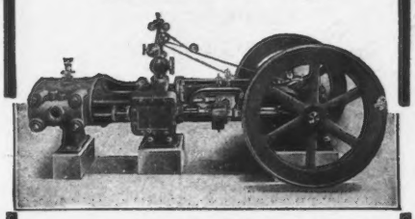
ROCK DRILLS

Simplest and Most Economical

McKIERNAN DRILL CO.

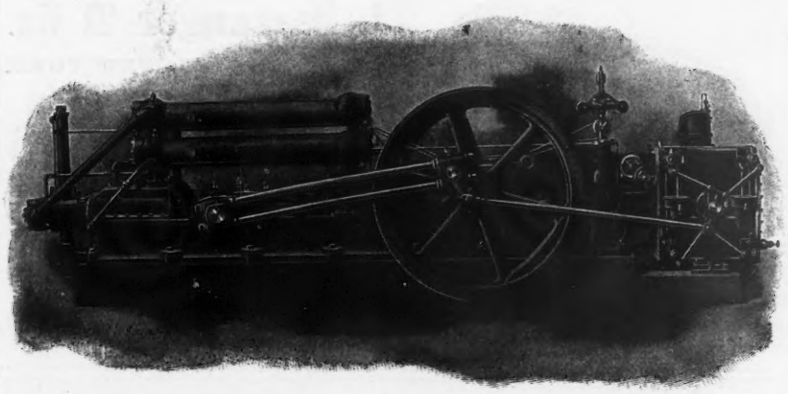
170 BROADWAY, NEW YORK.

A Good Mechanic Knows Why



....THE....

NORWALK IRON WORKS CO., South Norwalk, Conn.



MAKERS OF

AIR & GAS COMPRESSORS

For any volume and for any Pressure.

Our Fork-Frame Straight-Line

Air Compressors

Last longer and run more smoothly than others. Also why the removal of the bearings from the neighborhood of the steam cylinders improves their running qualities.

Air Compressors—Steam driven, Belt driven and direct connection. Electric Motors for every conceivable service.

Write for Pamphlet C 201 E.M.J.

CLAYTON

Air Compressor Works,

114-118 LIBERTY ST., NEW YORK.

They combine correct practice with the latest developed knowledge of principles of Air Compression.

THE FRANKLIN

AIR COMPRESSORS

MANUFACTURED BY

CHICAGO PNEUMATIC TOOL COMPANY,

CHICAGO—NEW YORK.

MINERS' LAMPS.

Write for catalogue, it sets forth the result of 30 years' experience.

Geo. Anton & Brother,

Box 164,

MONONGAHELA, - - - PA.

PORTABLE BUILDINGS

Made in all sizes; suitable for all climates; constructed entirely of wood; strong and substantial; wind and weather proof; any one can set them up. Send for catalogue.

Burnham-Standeford Company

521 Second St., Oakland, Calif.

HARBISON-WALKER REFRACTORIES CO.

PITTSBURG, PA.

Manufacturers of Highest Grade Refractory Materials

7,000 Regular Customers

Write for Booklet M

Fire Clay : Silica : Magnesia : Chrome

BRICK

Sole Agents For Carl Spaeter Magnesite

Importers of Chrome Ore

1,100,000 Daily Capacity

CYANIDE

The SCOTTISH CYANIDE CO., Ltd.

Leven, Scotland.

Agent: ROBERT CROOKS & CO.

138 Front St., N. Y., and Stock Exchange Building, Montreal.

Separators for Eliminating Water or Oil

CRANE Steam and Oil Separators were designed after careful study of the principles of separation and embody a number of exclusive features. In addition to the regular types of horizontal and vertical separators, we manufacture receiver separators with extra large cubical capacity.

We will be pleased to furnish estimates and drawings on separators to conform to peculiar local conditions.

Send for advance Circular No. 01, which contains drawings and prices of all the various styles of separators, as well as an explanation of the uses of the different types.

CRANE CO.

CHICAGO

ESTABLISHED 1855.

Branches in Principal Cities.

The Emerson Steam Pump

Front.

Best in the World

for

all operations where reliability is essential. They have no packing glands, stuffing boxes, rubbing surfaces, exhaust pipe, rocker arms, pulleys, belts, fly wheels, priming pipes; no adjustments, make no noise. We cut out all the troublesome parts that are necessary adjuncts to other pumps. It has more points of merit and less of demerit than any other. They will handle gritty material without damage to themselves that would destroy other pumps in short order. There is nothing made so reliable, nothing so simple or that will stand rough usage or exposure to all kinds of weather or that requires so little attention or so few repairs. Our catalog explains it in detail. Ask about our Quick Cleaning Strainers and Foot Valves. They are great, too.

Rear.

The Emerson Steam Pump Co.,

Office and Works:

Prince Street and Strand

Alexandria, Va., U. S. A.

LATROBE

Grusher Rolls and Shells

Forged, Punched and Rolled from Solid Steel Ingots.

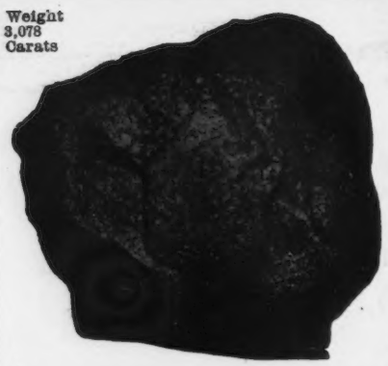
Railway Steel-Spring Co.,

71 Broadway, New York.

Marvin Electric Drills

are in daily use that have been in continuous service for six years.

MARVIN ELECTRIC DRILL COMPANY, Binghamton, N. Y.



Weight 3,078 Carats

J. Baszanger & Co.

108 FULTON ST., NEW YORK

IMPORTERS OF

CARBONS

(BLACK DIAMONDS)

FOR DIAMOND DRILLS

Finest Goods Sent on Approval

Opposite is largest carbon ever found (one-third actual size); was sold and broken up by us.

DEMING TRIPLEX MINE PUMPS

FOR ANY POWER

Built in sizes, 2 x 2 to 14 x 14

The Deming Company, Salem, Ohio.

AGENCIES:

Hendrie & Bolthoff M. & S. Co., Denver
Henshaw, Bulkley & Co., San Francisco
Harris Pump & Supply Co., Pittsburg
Henion & Hubbell, Chicago
W. P. Dallett, Philadelphia
Chas. J. Jager Co., Boston
Ralph B. Carter Co., New York
L. Booth & Sons, Los Angeles
English Iron Works Co., Kansas City

Who Builds the Best Mine Pump?

PRESCOTT

FRED M. PRESCOTT STEAM PUMP CO., • Milwaukee, Wis.

"We Build Complete Plaster Mill Plants; All Sizes."

Complete Plans Furnished.

The C. O. Bartlett & Snow Co.

CLEVELAND, OHIO, U. S. A.

Diamond Bit Setting

—FOR—

DIAMOND CORE DRILLING

Any Size. Any Kind

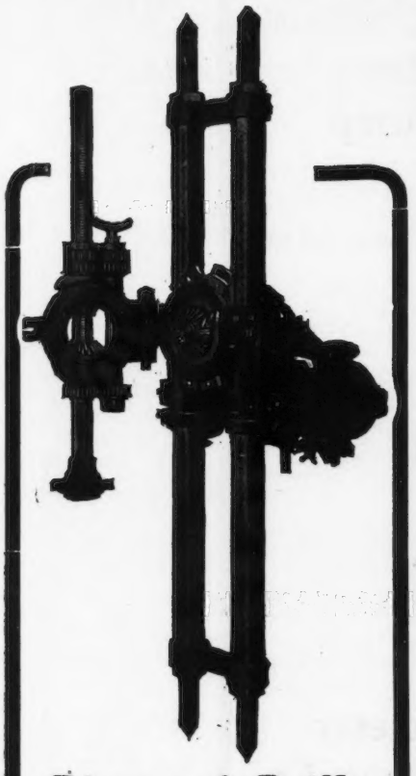
Specially Selected Carbon Diamonds for Diamond Drill Work.

Diamond Drilling by Contract. Diamond Drill Expert. Geological Expert.

Second-Hand Diamond Core Drills Bought and Sold.

WM. M. STURGES

410 Linden Street, - Scranton, Pa.



Diamond Drills take out a Solid Core.

These drills are constructed in capacities of from 300 to 6000 ft. and are invaluable for prospecting. Being fitted with our improved Hinged Swivel Head and Hydraulic Feed, they represent a great advance over all other Diamond Drills on the market.

Let us send you our *Catalog No. 15* Describing and illustrating our drills in detail.

AMERICAN DIAMOND ROCK DRILL COMPANY

95 Liberty St., New York

Cable Address: Occiduous, New York

JACKSON HAND POWER DRILL

OPERATES BY TURNING A CRANK

This is the most effective method known of utilizing a man's energy.

The Jackson Drill is so constructed that the operator can do MORE work with less expenditure of physical energy than if he were using a hammer and bit. It is possible, therefore, for one man with this drill to do as much work as three men could by the old method; in like manner, two men will accomplish as much as six.

Nearly 1500 in Use *Guaranteed for 2 Years*

SEND FOR CATALOG No. A-17

H.D. CRIPPEN MFG. CO.
25 BROAD ST. N.Y.

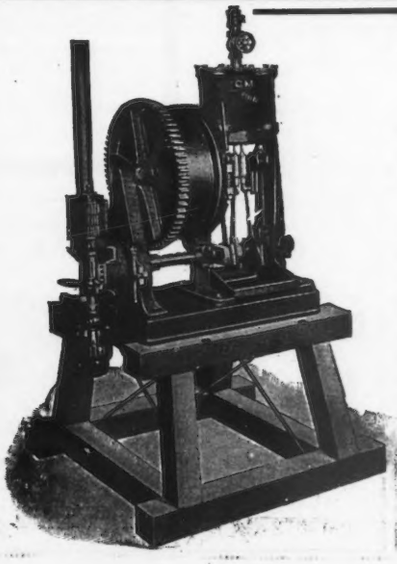
SOLE MANUFACTURERS.

Trade SB Mark

Fine Tool Steel

Mining Drill and Oil Well Steel a specialty. Particular attention to Die Blocks and Cutter Blanks, and all Forgings for Tools and Machinery.

BRAEBURN STEEL CO., Braeburn, Pa.



DIAMOND DRILLS

The Standard Diamond Drills are made in all capacities from 350 feet to 6000 feet or more, and are designed for hand power, horse power, steam, air and electricity.

The one shown in the illustration is our "C M" type which is especially designed for boring holes not exceeding 1000 feet in depth. It is driven by a double cylinder engine; has a hinged swivel head, and the hoisting drum is provided with a friction band-brake so that the rods can be lowered without the use of the engine.

For complete details of our full line of drills send for our 100 page illustrated catalogue.

STANDARD DIAMOND DRILL CO.
Chamber of Commerce, Chicago, U. S. A.

"UNION"
DIAPHRAGM TRENCH PUMPS
MADE ONLY BY
Union Elevator & Machine Co.
Chicago, Ill., U.S.A.

EDSON MNFG. CO'S.
DIAPHRAGM
TRENCH PUMPS

NOTICE
THE LARGE CAPACITY
No. 3 Edson Outfit, 1 man, 4000 gals. per hr.
No. 4 Edson Outfit, 2 men, 6000 gals. per hr.
Outfits complete for immediate use, including Pump, Edson Special Suction Hose, Brass Couplings, Strainer and Spanner.
Send for GUARANTEE TRIAL OFFER.
EDSON MANUFACTURING CO.
280 Atlantic Ave., • • • Boston, Mass

R. D. Wood & Co.
400 Chestnut Street, Philadelphia, Pa.
Centrifugal Pumps
For Mines and Sinking Purposes
GRAVEL and WATER PUMP
For Placer Mining a Specialty
CIRCULATING PUMP

"The Gouverneur"
SAND PUMP.

The most economical means of transporting Sand, Gravel, etc., on the market. The Hard Metal Lining thoroughly protects the shell or case, and may be renewed at a nominal cost.

For circulars and information address

Johnson Iron Co.,
GOUVERNEUR, N. Y., U. S. A.

Pump Out Your Mine Shafts

with a pump that gritty, muddy water cannot injure.

The Pulsometer Steam Pump

is built for hard work. Has no easily deranged inside or outside mechanism.

It is simple, handy, efficient and durable.

Requires neither engine, belt, oil, packing, nor special foundation; merely a steam pipe from the boiler.

Will operate as well suspended as placed stationary.

For Coal and Ore Washing

and all rough-service, low lift pumping, it is without an equal.

OUR CATALOGUE IS FREE

Pulsometer Steam Pump Co.
15 Battery Place, New York.

Henion & Hubbell, Chicago
J. J. Shannon & Co., Philadelphia
Perrin, Seamans & Co., Boston
K. C. Contractors' Supply Co., Kansas City
The Caldwell Bros. Co., Seattle
Harron, Rickard & McCone, San Francisco
Miller Supply Co., Huntington, W. Va.
H. W. Petrie, Toronto, Canada

SPRING PAINTING.

Seasonable talk on GOOD PAINT for the preservation of all classes of METAL and WOOD is contained in the new Pamphlet B-42.

Write for a Free Copy. Paint Department,

JOSEPH DIXON CRUCIBLE COMPANY,
JERSEY CITY, N. J.

MINNEAPOLIS STEEL AND MACHINERY CO.

Designers and Builders of

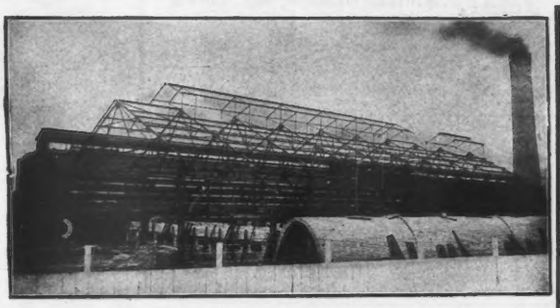
STEEL STRUCTURES

for

MINES - SMELTERS - BRIDGES - BUILDINGS

Designs and Estimates Cheerfully Furnished

HOME OFFICE AND WORKS **MINNEAPOLIS** MINNESOTA, U. S. A.



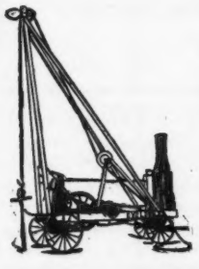
THE STRUCTURAL STEEL WORK FOR THIS BUILDING WAS MANUFACTURED AND ERECTED BY THE M. S. AND M. CO.

Shaw Eclipse Rock Drill
Air Hammer and Rock Drill Sharpener

The Shaw Drill is emphatically a portable machine and it can easily be handled by one man with or without column or feeder. It is economical in air consumption as it only requires 17 cubic feet of free air per minute, at a pressure of 80 to 100 pounds. Its capacity naturally depends upon the kind of material drilled, but we guarantee it to drill a one-inch hole 3 and 4 inches per minute in granite or quartz, and 7 and 8 inches in limestone or sandstone. We have more facts for you in the catalogue. Send a postal for it.

Smith, Parker & Boyd, 1740 Broadway, Denver, Col.

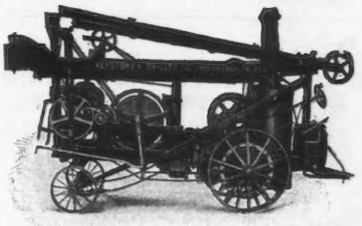
Sole Agents for United States, Canada and Mexico



The Cyclone System of Drilling

is the only method for sinking a hole into rock on a rapid and paying basis. It does not grind or wear the rock away, but chips it out—like a stone mason's chisel—and the chips are automatically pumped to the surface, giving you an accurate report of each stratum as it is passed through. For the full details, see our new catalog.

The Cyclone Drill Company,
Orrville, Ohio.

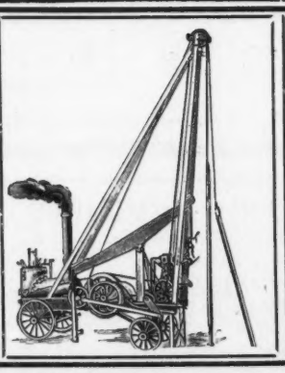


THE KEYSTONE GOLD FINDER

is a highly perfected well drilling machine for mapping alluvial deposits of placer gold. It drills a 6-inch hole through any formation, to any depth up to 400 feet and brings an exact area of material to the surface for an accurate test. Machine and crew will make about one test hole per day. If proper care is used the results obtained are absolutely dependable. WE WILL FURNISH ADDRESSES OF 100 GOLD DREDGING COMPANIES WHO HAVE INSTALLED PLANTS ON THE RECORDS OF OUR GOLD FINDER and who are to-day operating from one to a dozen Keystones each. The machine is portable, self-moving or animal drawn, as desired, and can be sectionalized for transportation in rough country. It can be operated from a flat boat in assaying lake and river beds.

Our Catalog No. 2 is a complete and exhaustive treatise on the subject of Mineral Prospecting with Well Drills.

Keystone Driller Co.
NORTH ROAD, BEAVER FALLS, PA.



You'll find good water if you drill deep enough.

It may not be good on the surface, but a

Crown Drilling Machine

will reach the "pure goods." Our small machines are the best for farm wells—any size well, 3½ in. to 6 in. It's a little money maker.

Our Catalog tells you everything we make. It's free.

The Crown Drilling Mach. Co.,
Akron, Ohio.

YOUR buyer has been looking for Bearings with our Trade Mark.

Write for Catalogue.

AUBURN BALL BEARING CO.,
ROCHESTER, N. Y, U. S. A.

BUFF

Mining Transits and Levels

Secure accuracy, simplicity and manipulation; lightness with strength.

Send for new catalog No. 30.

BUFF & BUFF MFG. CO.,
Jamaica Plain Station, BOSTON, MASS.

Established 1870.

HELLER & BRIGHTLY,

MANUFACTURERS OF

Engineering Mining and Surveying **INSTRUMENTS.**

Cor. Spring Garden St. and Ridge Ave.,

CATALOGS ON APPLICATION. **Philadelphia, Pa.**

ESTABLISHED 1845.

W. & L. E. GURLEY,

TROY, N. Y

Largest Manufacturers of

Civil Engineers' and Surveyors' Instruments

Send for Illustrated Circular Price List showing latest improvements.

J. C. Ulmer & Co.,

MANUFACTURERS OF

HIGHEST CLASS

Engineering, Surveying, Mining Instruments.

CATALOG ON APPLICATION.

Cleveland, Oh o.

ESTABLISHED 1872

When in the Market for Strictly First-Class

SURVEYING and MINING INSTRUMENTS

Acknowledged to be the Most Precise Made

Consult **F. E. BRANDIS SONS & CO.**

812-814 Cates Ave , Brooklyn, N. Y.

LIGHT MINING INSTRUMENTS

Accuracy, Rigidity, Compactness and Durability Unsurpassed. May we send you our Catalog?

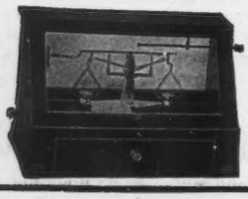
HANNA MFG. CO.
TROY, N. Y.

Denver Button Balances

are especially designed and built to combine the advantage of absolute constancy and a high degree of accuracy with rapidity in taking readings of extreme sensitiveness.

Denver Balance Company,

Denver, Colo., U. S. A.



The Catalog Is Ready for You.

Keuffel & Esser Co., 127 Fulton Street, NEW YORK.

BRANCHES: Chicago: 111 Madison St. St. Louis: 813 Locust St. San Francisco: 40 Oak Street, Cor. Market.

Drawing Materials, Surveying Instruments, Measuring Tapes.

We make the largest variety of **Measuring Tapes** of highest grade, greatest accuracy and most practical design.

Special Tapes for Use in Mines.

Flat Wire Tapes, graduated by rivets or on brass sleeves, of improved device. Special provisions for protecting the tapes against corrosion from mine waters.

The K & E Mine Reel is the most practical and complete reel for extra long, flat wire tapes

Complete **New Catalogue**, 1906 (550 pages), on request.

Highest Awards: Grand Prize, St. Louis, 1904; Gold Medal, Portland, 1905.

STARRETT TOOLS are the Standard for

Accuracy, Workmanship, Design and Finish

They embody the best and most advanced ideas in practical Tool-making

Draughting Apparatus

Steel Tapes
Plumb Bobs
Hack Saws
Squares
Steel Rules
Micrometers
Speed Indicators
Calipers
Dividers

Screw Drivers
Wire Gauges
Caliper Squares
Protractors
Bevels
Cutnippers
Gauges
Levels

Leveling Instruments, etc.

Send for free Catalogue No. 17K of Fine Mechanical Tools. 176 pages, illustrated.

The L. S. Starrett Company,

Athol, Mass., U. S. A.

NEW YORK CHICAGO

MAHN & CO.,

300-302 Olive St., St. Louis, Mo.

Makers of

SURVEYING, ENGINEERING and MINING INSTRUMENTS

Illustrated Catalogue on Application.

F. WEBER & CO.

Philadelphia, Penn.

St. Louis Mo. Baltimore, Md.

Engineering Instruments Draughtsmen's Supplies

2nd-hand Instruments bought and sold

NEW! Sphinx Bronze Tapes will not rust

LUFKIN MEASURING TAPES ARE THE BEST

For Sale Everywhere Send for Catalog.

LUFKIN RULE COMPANY, Saginaw, Mich., U.S.A.

EUGENE DIETZGEN CO.

181 Monroe St., Chicago 119-121 W. 23d St., New York
14 First St., San Francisco 145 Baronne St., New Orleans

MANUFACTURERS AND IMPORTERS OF

Drawing Materials and Surveying Instruments

OUR RAPID PRINTING BLUE PRINT PAPER has no equal.

AUTOMATIC ELECTRIC BLUE PRINTING MACHINE.

Send for descriptive circular.

REPAIRING OF ENGINEERING INSTRUMENTS PROMPTLY DONE.

Our 412 page illustrated catalogue on application.

HENRY HEIL CHEMICAL CO.

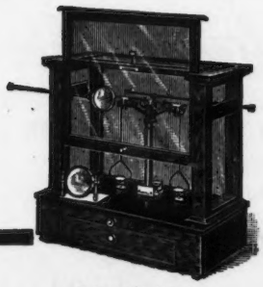
210 to 214 South 4th Street, St. Louis, Mo.

ASSAY and LABORATORY SUPPLIES

Specialties: Borax Glass and Molybdic Acid.

Chemical Apparatus and Chemicals, Agents for the U. S. for the celebrated Battersea Crucibles, Muffles, Scorifiers, etc. Soda Ash, Bone Ash, and Heavy Chemicals. Oldest and largest house in America. Before buying elsewhere apply to us for prices. Satisfaction guaranteed.

Write for Catalogue of 821 pages.



Balance No. 1005 A.

Assay and Analytical

BALANCES

Fine balances and weights for all purposes. Accuracy a feature of our balances. Send for our illustrated catalogue.

VOLAND & SONS,

SUCCESSORS TO

Voland & Van Zelm,

New Rochelle, N. Y.

SURVEYING and SCIENTIFIC INSTRUMENTS

Drawing Materials and Supplies. Repairing Engineering Instruments a Specialty. Send for Catalog.

Adolf Frese Optical Co.,

Los Angeles, California

E. G. SOLTMANN

DRAWING MATERIALS

125 E. 42ND ST. NEW YORK

Write for Price List No. 17 of

DRAWING MATERIALS

and Samples of Papers.

Electric Light Prints.

Prices for Large Prints up to 4½ x 12 ft

BLACK PRINTS	On Paper, Sq. ft.	**3c.**
BLUE PRINTS	On Paper, Sq. ft.	**2c.**
BLACK or BLUE	On Cloth, Sq. ft.	**5c.**

Write for Sample Prints.

Mention Eng. & Mining Journal when ordering.

Everything Necessary

FOR

ASSAYERS and CHEMISTS

BALANCES and WEIGHTS

C. P. Chemicals and Reagents

Platinumware

Electric Laboratory Furnaces

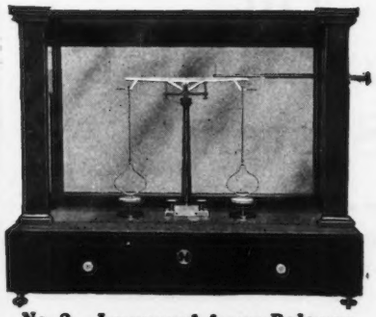
WE HAVE the most complete and most modern stock of Laboratory Apparatus of any house in the U. S. A.

EIMER & AMEND,

205-211 Third Ave., New York.

1840 The Standard of Excellence 1906

Assay Balances



No. 2—Improved Assay Balance

7½ Inch Beam. Sensibility 1-50 Mg.

The Best Low Price Assay Balance Made

LEST you forget: Troemner's Assay Balances are *all* made now with *Clear Sweep Rider Carriages*. There is *now no obstruction* on the *top* of the beam. The rider can be placed at *any* point on the beam, from O at the center, which is directly over the center knife edge to the last division on the beam, which is directly over the *end* knife edge and represents the *full* weight of the rider used.

Price List on Application

HENRY TROEMNER

PHILADELPHIA, PA., U. S. A.

See others if you will

but see

The Keller Assay Balance

first; then you will buy no other.

For

it is the **World's** best.

We will leave the decision to you.

The SALT LAKE HARDWARE CO.

SALT LAKE CITY, UTAH.

Ask for Catalogue B.

ALOE'S

Engineer's Transit

$185 New Model $185

Designed for high class engineering work. Includes Level and Clamp Tangent, with five-inch vertical arc with vernier reading to single minutes, graduations on Silvered Brass, in box with Tripod, Plumb Bob, Sunshade, Magnifier, Screw Driver, and Adjusting Pins. Weight with Tripod complete about 20 pounds.

Aloe's Instruments for 60 years have been the **Standard of the World.**

OUR GUARANTEE:
Your Money Back If Wanted

Established 1860.

A. S. ALOE CO.,

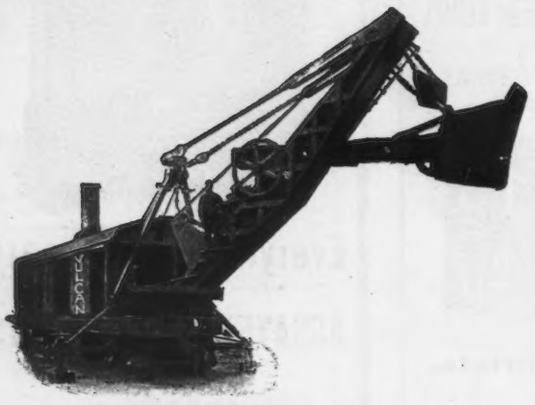
531 Olive St., St. Louis, Mo.

Transits and Levels to meet Mine Requirements.

Berger Mine Instruments are of new and improved patterns. They are designed and built especially for mine use, and are guaranteed to give satisfaction. A postal gets the catalog.

C. L. BERGER & SONS, - 37 Williams Street, Boston, Mass.

Steam Shovels

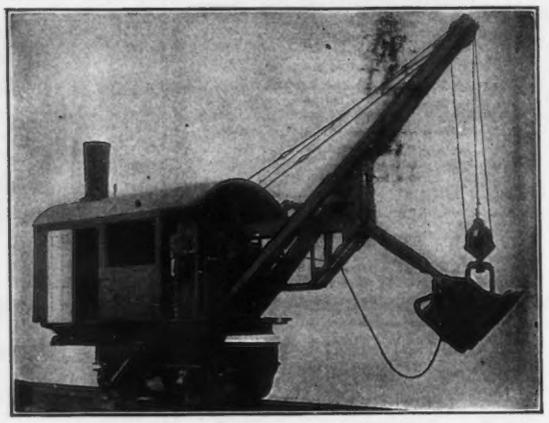


Good steam shovels will earn more money for the contractor. We are building the best that can be constructed because we use the best material obtainable and employ skilled workmen to erect it. Write today for full information.

Vulcan Iron Works Co.,
110 Vulcan Place, Toledo, O.

The New Steam Shovel

Can be operated for moderate output with one man and one half ton of coal. Saves time, trouble and money. Swings through complete circle. Can be used as locomotive crane. Write for catalogue



The Thew Automatic Shovel Co., Lorain, Ohio

AUTOMATIC CYANIDING MACHINERY

THE BLAISDELL SYSTEM, consisting of Excavators, Distributors, Conveyors and Tailing Stackers, will transfer sand from a collecting to leaching vat or to a dump, at the rate of 100 tons per hour at a cost of three-quarters of a cent per ton.

BLAISDELL EXCAVATORS remove sand from a vat at the rate of 100 tons per hour, at a cost of one-fifth of a cent per ton.

THE BLAISDELL SYSTEM

is operating, or under contract for installation, at the following plants:

300-ton Cyanide Plant,		Chas. Butters & Co., Virginia City, Nevada.
200-Stamp Mill of		El Oro Mining & Railroad Co., Ltd., El Oro, Mex.
120	" " "	Cia. Minera Las Dos Estrellas, S.A., El Oro, Mex.
100	" " "	Peregrina Mining&Milling Co., Guanajuato, Mex.
60	" " "	San Prospero Mining Co., Guanajuato, Mexico.
120	" " "	The Black Mountain Mining Co.,Magdalena,Mex.
100	" " "	Tonopah Mining Co. of Nevada, Tonopah, Nev.
100	" " "	New Modderfontein G.M. Co., Johannesburg, S.A.
200	" " "	Langlaagte Deep Mines, Johannesburg, S. Africa.

BLAISDELL COMPANY,

Engineers for the Economical Handling of Material.

CYANIDE PLANTS, CONCENTRATION WORKS, STAMP MILLS

General Offices: Pacific Electric Bldg., Los Angeles, California.

London, England, Fraser & Chalmers, Ltd.
Johannesburg, South Africa, Fraser & Chalmers, Ltd.
Montreal, Can., The John McDougall Caledonian Iron Works, Ltd.

The "Brownhoist" System

of handling ore and coal has made the world's record for speed and economy. "Brownhoist" machines are built in all sizes and in all capacities from 1-2 ton to a machine that will pick up and empty a 120,000 lb. car.

In construction they are in many different forms designed to meet varying conditions and requirements.

Write and tell us your hauling, handling and conveying problems and we will estimate on the exact "Brownhoist" machine to fill them.

The Brown Hoisting Machinery Company

New York, Pittsburg, London.
Main Office and Works—Cleveland, Ohio.

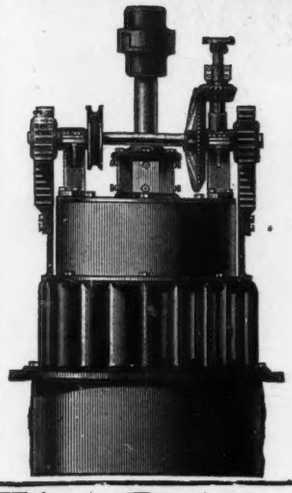
LEVIATHAN BELTING.

The incessant wet of the mine or paper mill, the constant grit of the cement mill, or brickyard, coal breaker, stamp mill, or crusher, or those extremes of heat and cold that so prey upon rubber belts affect it not. Our five-minute booklet will open great possibilities to you. Shall we mail it? 24

MAIN BELTING COMPANY, Sole Manufacturers

New York Chicago PHILADELPHIA Boston Buffalo

McGORMICK TURBINES



Adapted for vertical or horizontal shafts. Strong, durable and simple in construction. Economical in the use of water at all stages of gate.

If interested in water powers write for large illustrated catalogue.

S. MORGAN SMITH CO.,
YORK, PA., U. S. A.
Branch Office, 176 Federal St., Boston, Mass.

The Pelton Water Wheel Co.

Notwithstanding the San Francisco fire, this Company is filling orders as usual from its Eastern Works. Their new San Francisco plant under construction was not burned, and will be rushed to completion.

Estimates furnished on

WATER WHEELS, SHEET STEEL, RIVETED AND LAP-WELDED PIPE, COMPLETE HYDRAULIC PLANTS.

Catalogs on application.

The Pelton Water Wheel Co.

1259 Alice St., OAKLAND, CAL. | SAN FRANCISCO WILL BE REBUILT AT ONCE. | 143 Liberty St., NEW YORK, N. Y.

THE HUG WATER WHEEL

will give you more power, under the same condition, than any other wheel known. All orders filled promptly.

Write for Catalog.

HUG WATER WHEEL COMPANY,
DENVER, COLO.

CARBONS (Black Diamonds) and BORTZ for DIAMOND DRILLS

S. DESSAU'S SONS
IMPORTERS
180 BROADWAY
New York
N. Y.

DRYERS

Most Improved.
Thoroughly Automatic.
Highly Economical.
Great Efficiency.

American Process Co.,
62-64 William Street, New York.

Riveted Pipe For All Purposes
THOMSON & BOYLE CO., Los Angeles, Cal.

ARE YOU CONFRONTED WITH A DIFFICULT ORE-SEPARATING PROBLEM?

THE WETHERILL MAGNETIC SEPARATING PROCESS MAY PROVE THE SOLUTION.

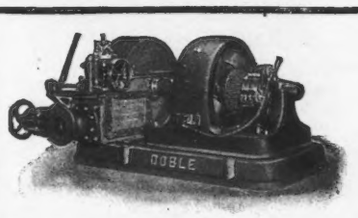
Write for Illustrated Pamphlet and information to
THE STEARNS-ROGER MANUFACTURING CO., Denver, Col.,
Manufacturing and Sales Agents for the United States.

The New American Turbine

Besides being most economical in running cost it has the lowest repair bill of any turbine on the market. More in catalog 19.

The Dayton Globe Iron Works Co.
Dayton, Ohio
The Pelton Water Wheel Co.
San Francisco, Cal., Pacific Coast Agents

DOBLE WATER WHEELS

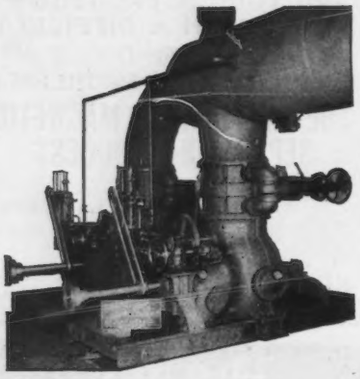


Specially Constructed for Mining and Hydro-electric Power Plants.

We have large new works under construction and are already doing business.

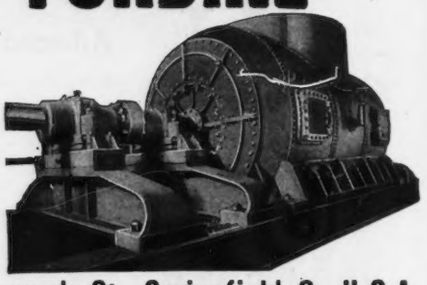
ABNER DOBLE COMPANY,
ENGINEERS,
Established 1850.
Fremont and Howard Streets,
San Francisco, U. S. A.

Exclusive Licensee in Canada, The John McDougall Caledonian Iron Works Co., Ltd., Montreal.



SAMSON TURBINE

HIGH EFFICIENCY at ANY GATE-AGE, QUICK SPEED and GREAT POWER are the three essential points demanded of a turbine driving generator. No other turbine maintains these three points to such a high degree of perfection, as the SAMSON.



JAMES LEFFEL & CO., 306 Lagonda St., Springfield, O., U.S.A.

HARRON, RICKARD & McCONE, San Francisco, Cal., Sole Agents for California, Arizona, and Nevada.

WOOD WATER PIPE

Our Strengthened Wood Pipe Before Being Coated With Asphaltum Pitch.

For all uses. Built to stand a pressure of 160 lbs to the square inch; that will not taint the water conveyed; that will not rust or corrode. Write for catalog and prices.

WYCKOFF WOOD PIPE CO., ELMIRA, N. Y., U.S.A.

Pittsburg Office, 1713 Farmers Bank Building.

Our New 132-Page

Hydraulic Handbook

is now ready and will be sent free upon request.

In hydraulic mining every dollar works overtime if you use

Root Spiral Riveted Pipe with Bolted Joints.

We are manufacturers of HYDRAULIC MINING SUPPLIES and are experienced in the making up of material adapted for MULE BACK TRANSPORTATION.

Abendroth & Root Mfg. Co.

Main office and Works **Newburgh, N. Y.**

—BRANCHES—

New York Pittsburg Chicago Mexico City.

EXCELSIOR WOODEN PIPE CO.,

Continuous Wooden Stave Pipe for Irrigation, Municipal Water Supply, Power Plants and Out-Fall Sewers.

Catalog and Estimates furnished upon application. Ask for Catalog No. 3.

OFFICES:
220 Broadway, New York.
Western Temporary Address: 564 9th St., Oakland, Cal

WOOD MINE AND ACID PIPE

Simply and Cheaply Installed. Most Durable.

Originators of Wood Steam Pipe Casings.

Spirally strengthened with Steel Hoop or Galvanized Steel Wire.

THE MICHIGAN PIPE CO., Bay City, Mich.

HAVE you ever figured out the saving you can make by replacing your wrought iron or cast iron pipe with **Wyckoff Wood Pipe?** It is less in first cost and has longer life. Not affected by mine water or acid fumes. Let us tell you about it. Ask for the catalog.

Established 1855.

A. Wyckoff & Son Co.,

Elmira, N.Y., U.S.A.

Ideal for mining purposes. Hundreds of miles of it **under pressure.** In one place it is under a pressure of 420 pounds. Our Spiral Riveted pipe is the lightest pipe made—easy to ship and to lay. We can save you big money on pipe, and at the same time render you a pipe service that will surprise you. **Just Right for Long Lines.** Send for Valuable Catalog.

American Spiral Pipe Works, CHICAGO, ILL.
New York Office, 26 Cortlandt Street

F. K. SIMONDS COMPANY
LOS ANGELES, CAL.
Riveted Steel Water Pipe for Hydraulic, Domestic and Irrigation Purposes, Well Casing, Fittings and General Sheet Steel Work

H. B. PERINE
Seattle, U.S.A.
Mining and Smelting Machinery

NATIONAL WOOD PIPE COMPANY
WOOD PIPE Woodward Patent Machine Banded
Wheeler Patent Continuous Stave
Bored Wood Water Pipe
MADE FROM CALIFORNIA REDWOOD OR SELECTED PUGET SOUND YELLOW FIR
Los Angeles Office: Sixth and Mateo Streets
San Francisco Office: 301 Market Street
Puget Sound Office: Olympia, Washington
A Booklet: "THE WHOLE STORY ABOUT WOOD PIPE," mailed free upon request

Your Business Interest

Demands that you protect your mine and the lives of your men against fire. The sure way to do this is with the

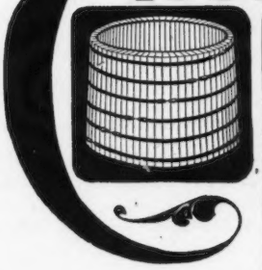
Vajen Head Protector

What is the cost of a number of helmets as compared to the destruction of your mine? When the mine is filled with smoke and poisonous gases, men are of no use unless equipped with Vajen Helmets, which keep them supplied with fresh air and protect them from gases and fumes. In this way they can reach the seat of the fire—no matter how hard to get at—and "kill" it before much damage is done. Better write us about the Vajen Helmet before it's too late. Will send you the booklet "Protection"—write now.

The Vajen-Bader Co.,
Richmond - - - Indiana

Zinc Precipitating Boxes
TANKS
Cyanide-Oil-Water Mining Tanks
Hammond Iron Works
Warren, Pa., U.S.A.
Herman Nieter, Sales Agent
180 Broadway, New York.
Krumbhaar & Aiken, Sales Agents, 201 Denegre Bldg New Orleans, La.

CYPRESS TANKS



CYPRESS MINE TANKS

Our Cypress wood tanks exemplify the perfection which results from twenty years' experience in building and studying the conditions of tank building. Long service is our aim, and it has been attained. Our tanks outlast any other make, never warping or shrinking, standing perfectly all conditions of weather. They hold paint well, and are practically impervious to acids. Write for free Catalog.

G. M. DAVIS & SON,
PALATKA, FLA.

Economy in Buying Gears

Is the buying of such gears as give the longest and most satisfactory service for the money and power expended upon them.

¶ Caldwell-Walker gears last longer than others, give higher efficiency under actual scientific tests, and in many cases cost no more than inferior gears.

H. W. Caldwell & Son Co.,
CHICAGO, 17th St. and Western Ave.
New York, 95 Liberty St.
Woodward, Wight & Co., Ltd., New Orleans.

The Gold Medal Cap Crimper and Fuse Cutter

LOHEVILL, Wis., March 28th, 1905.
THE METALLIC CAP MFG. CO., 271 Broadway, N. Y.
Gentlemen:
Your Cap Crimper works better than anything I ever used. It is perfectly safe and sure fire, and I must say it crimps the cap water tight. I would never be without one. Very respectfully yours, WM. WISKE,
Blaster for Milwaukee Monument Co.

THE METALLIC CAP MFG. CO.
271 Broadway, New York.

Strictly C. P. Acids and Ammonia
For Laboratory Use and Fine Chemical Work. Also Commercial Acids.
MANUFACTURED BY
Western Chemical Manufacturing Company, Denver, Colo.

M. H. TYACK,
Swansea, England.
Metal and Mineral Broker.
Weighing, sampling & assaying attended to for Sellers. Agencies entertained.
Telegrams & Cables: "Tyack Swansea."
Code used, A. B. C., Fifth Edition.

THE
BRITANNIA SMELTING COMPANY,
LIMITED.

Buyers, Smelters and Refiners of GOLD, SILVER AND COPPER ORES, MATTE, BULLION AND CYANIDE PRODUCTS.

Works at
Crofton, Vancouver Island, B. C.

BALTIMORE COPPER SMELTING AND ROLLING COMPANY
Smelters and Refiners of
COPPER
Matte, Bullion, etc.
ELECTROLYTIC COPPER
(B. E. R. Brand)
SHEET COPPER, SULPHATE of COPPER
Keyser Building,
Baltimore, Md., U. S. A.

Matthiessen & Hegeler Zinc Co.
La Salle, Ill.
Special sizes of Zinc cut to order. Rolled Battery Plates. Selected Plates for Etchers' and Lithographers' Use. Selected Sheets for Paper and Card Makers' Use. Stove and Washboard blanks.
Smelters of Spelter
AND MANUFACTURERS OF
Sheet Zinc and Sulphuric Acid
Zincs for Leclanche Battery.

Tacoma Smelting Company,
BUYERS OF
GOLD, SILVER, LEAD and COPPER ORES
COPPER MATTE and FURNACE PRODUCTS
ELECTROLYTIC COPPER REFINERS
TACOMA, - - - - - - - - WASHINGTON

THE TYEE COPPER CO.
(LIMITED)
PURCHASERS AND SMELTERS OF COPPER, GOLD AND SILVER ORES
Smelting Works at **Ladysmith, Vancouver Island**
Head Office—DUNCANS STATION, Vancouver Island, B. C.
CLERMENT LIVINGSTON, General Manager.

St. Louis Smelting & Refining Co.,
Buyers of
Lead Ores, Concentrates, Slags and Base Bullion
620 Frisco Bldg., St. Louis, Mo.

ST. JOSEPH LEAD COMPANY
PIG LEAD
5 NASSAU ST. - - - NEW YORK

BABBITT METAL
MANGANESE BRAND
Made by Syracuse Smelting Works, is the one metal positively the best. Don't ask for any but "Syracuse."
SYRACUSE SMELTING WORKS,
Offices and Representatives at New York, Montreal, and all large Western Cities.

C. PASS & SON, Ltd., Bristol, England;
SELL
Soft Pig Lead, Ingot Copper, Antimonial Lead, Tin Alloy and Antimony Alloys.
BUY
Dross or Residues Containing Tin, Copper or Lead.
HIGH PRICES PAID FOR TIN ORES.

SPECIALTY—SMELTING OF COMPLEX ORES
Highest prices paid for Ores, Concentrates, Bullion, Mattes, Slags, Sulphides, Residues, etc., containing, separately or in combination, the metals
COPPER, SILVER, GOLD AND LEAD
Send trial lots, samples or analyses, with particulars of qualities available, to
ELLIOTT'S METAL CO., Ltd.
PEMBREY COPPER WORKS, BURRY PORT, SOUTH WALES
Also at Birmingham, Liverpool, Manchester and London
EXCELLENT SAMPLING FACILITIES. ADVICE AND ASSISTANCE GIVEN AS TO CONCENTRATION OF ORES

– SLIME PLANTS – CHLORINATION TANKS – AGITATION TANKS – ZINC BOXES – ZINC –

– PULP THICKENERS –

THE PACIFIC TANK CO BUILDS

CYANIDE PLANTS

– ZINC LATHES –

SAN FRANCISCO OFFICE Temporarily Located at 518 11th Street, Oakland, Cal. LOS ANGELES, CAL. OLYMPIA, WASH.

SEND FOR FREE ILLUSTRATED CATALOGUE

De Lamar's Copper Refining Co.

Ghrome, N. J -:- Grasselli, Ind.

Copper and Lead

Smelting and Refining

Argentiferous and Non-Argentiferous Copper and Lead Bullion, Mattes and Ores treated on Toll or Purchased. Dore Bars Refined. Copper Sulphate.

L. Vogelstein & Co., General Agents

90-96 Wall Street, New York

YOU Save Time when using Johnston's Improved Tape and Reel. The Booklet tells how. Write for it.

ROBERT JOHNSTON
WILKES-BARRE, PA.

TRADE MARK

W. P. McGAHA CO.
116 Main St., Seattle, Wash.

Acid Proof Hot and Cold Metal Paints For Smelters and Mining Plants.

Guaranteed to stand more heat and last longer than any paint in the market.

ORE ❧ COAL ❧ ASHES ❧ GRAVEL

AND

Concrete Materials Conveyed and Distributed

—BY—

Robins Conveying, Hoisting and Elevating Machinery

—AT—

Minimum Cost, Attendance, Delay
Maximum Capacity, Speed, Durability

Write for Bulletin

ROBINS TRADE MARK

ROBINS CONVEYING BELT CO.,

16 PARK ROW, NEW YORK CITY

Chicago, 749 Railway Exchange Building. ❧ Boston, 53 State Street.

UP AND DOWN!

Applied to that excellent steam specialty

POWELL'S Signal Oiler

means

Lever Up— Oil Dropping.

Lever Down— Oil Shut Off.

And the moving lever don't interfere with the adjustment either.

There could not be a more perfect oiler than this.

We have other surprisingly good specialties.

Apply to the manufacturers.

Address Department "R."

The Wm. Powell Co., Cincinnati, Ohio
New York Depot, 51 Cliff Street
Philadelphia Dept., 518 Arch Street

JAMES L. NORRIS
ESTABLISHED 1869
Member Patent Law Association
Counsellor in Patent Causes
SOLICITOR OF AMERICAN AND FOREIGN
PATENTS
Over Thirty Years' Active Practice
F & Fifth Sts., N.W., Washington, D. C.
INFORMATION SENT FREE ON REQUEST

PATENTS, TRADE MARKS, COPYRIGHTS.
Twenty-five years active practice.
SPECIALTY: Working on the failures of others. Difficult and Rejected Cases solicited.
SIGGERS & SIGGERS,
Suite 32, N. U. I. Building, Washington, D. C.

WM. H. BRISTOL,
ELECTRIC PYROMETERS.
All ranges to 2900° F. Practical for every day use. Accurate and inexpensive. Write for full information.
WM. H. BRISTOL,
45 Vesey Street, New York.

Bristol's Patent Steel Belt Lacing
No Special Tools
Saves Time and Money.

Greatest Strength with Least Metal.
Send for Circular AE and Free Samples.
THE BRISTOL CO., Waterbury, Connecticut.

AJAX DRILL SHARPENER
T. H. PROSKE
1734 Fifteenth Street, Denver, Colo.

UTAH MINES AND STOCKS.
Information and Market Letter Free.
Wm. H. Tibbals, P. O. Box 44,
Suite 302-8 Herald Bldg. Salt Lake City.

"Hunt" Electric Hoisting Engines.

Built for heavy and continuous work, in sizes from 5 to 150 horse-power, and having drums, clutches, brakes and other parts of generous proportions. They may be operated either by an alternating or a direct current motor. The gears are completely enclosed in an oil-tight and dust-proof case, and they run in a bath of oil. Our catalog contains full particulars and will be sent on request

C. W. Hunt Company,
Cedar St., West New Brighton, N. Y.
New York Office, 45 Broadway.

AIR COMPRESSORS Single, Duplex, Two Stage, Belt, Steam or Motor drive.
BURY COMPRESSOR COMPANY, - - ERIE, PA.

WILLIAMS PATENT CRUSHERS

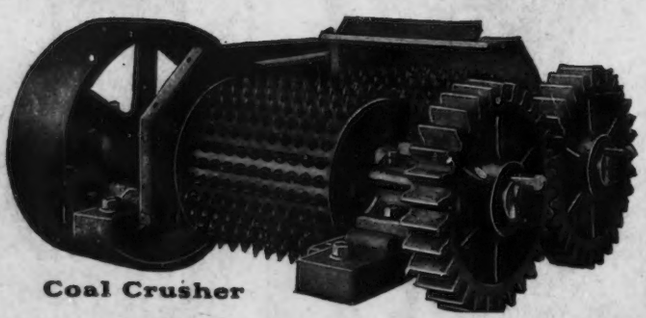
will crush
COAL FOR COKE OVENS
DEBRIS FOR MINES
1000 IN OPERATION
Write for Bulletin No. 5.
The Williams Pat. Crusher & Pulverizer Co.
Old Colony Bldg., Chicago.
Works, St. Louis.

Chemical and Metallurgical Cases Conducted in Courts and Patent Offices.

THOMAS J. JOHNSTON
Counselor at Law.
11 Pine Street New York City.

Patent Causes. Patent Soliciting.

Coal and Coke Crushers



Coal Crusher

Our folder will tell you all about the different styles we manufacture. Also gives sizes, capacities, etc.

VULCAN IRON WORKS, WILKES-BARRE, PENNA., U. S. A.

Flory Hoisting Engines

For contractors, pile driving, quarry and mine duty. Also tail rope haulage, inclines, slate mining machinery and cableway specialties. Ask for the catalog. We always guarantee satisfaction.

S. Flory Mfg. Co.
Bangor, Pa.

Sellers' Restarting Injector
A Simple and Reliable Boiler Feeder

Has wide range of capacities and lifts water promptly with hot or cold pipes. Is made of the best bronze, the workmanship is perfect, and is easily repaired. It is made to standard gauges.

WRITE FOR BOOKLET

JENKINS BROS., New York, Boston, Philadelphia, Chicago, London